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IRRIGATED LANDS

— OF —

United States, Canada and Mexico

BY CHARLES R. PRICE

Covering Full Reliable Information as to the Twenty-eight Federal Reclamation Projects now being Completed within the United States; Covering Locations, Products, Cost of Land, Water, Etc., Transportation, Climatic Conditions and all Essential Facts; Together with Reference to Other Similar Projects to be Indulged at a Future Date.

To which is Appended Similar Complete Information Regarding Prominent Syndicatal Irrigation Enterprises in the United States, Mexico and Canada.

Comprehending Information as to How Lands May be Pre-empted, Costs, to Whom to Make Application; with a Synopsis of the Laws Relating Thereto.

Supplemented by

Irrigated Lands of the West Coast of Mexico

BY J. CLYDE POWER, C. E.



LOS ANGELES, CAL.
PAN-PACIFIC PRESS.
1909

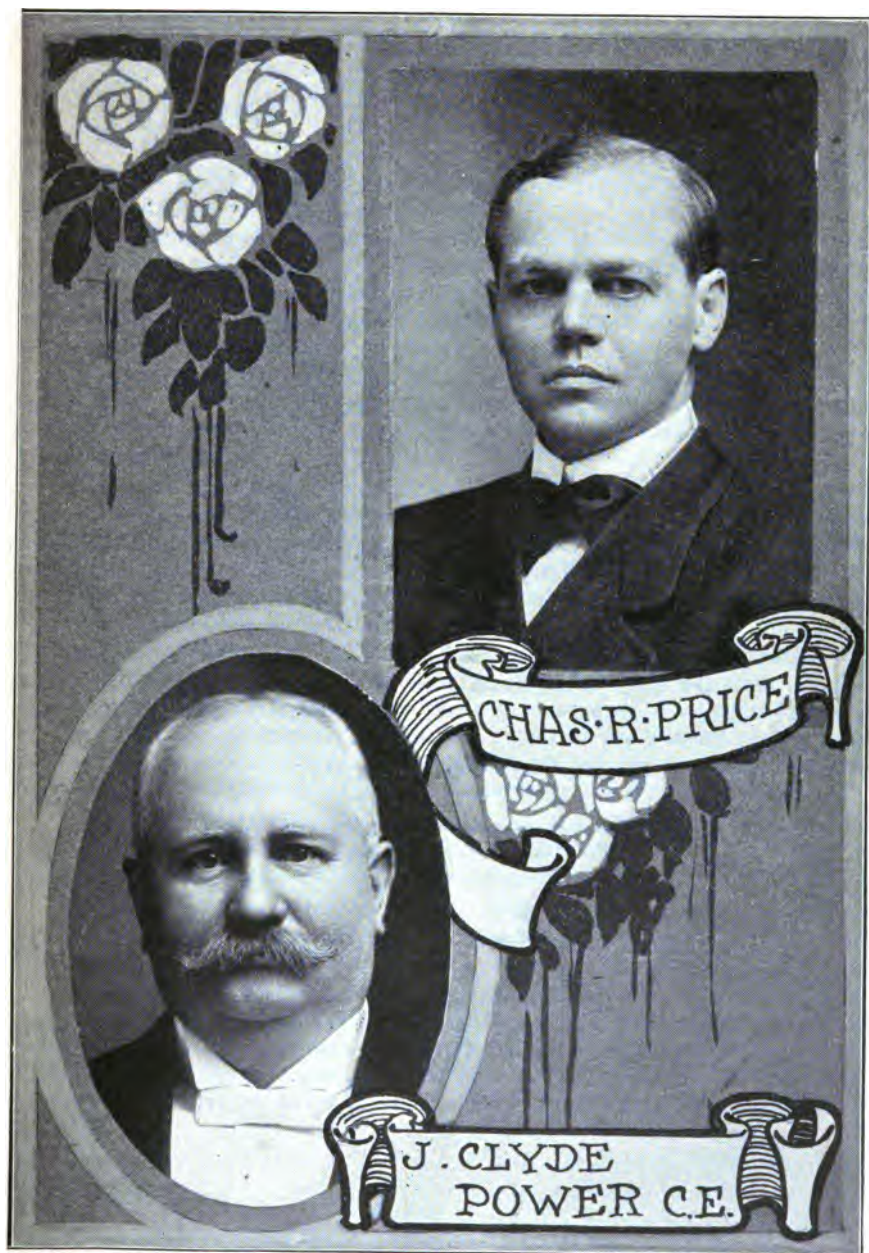
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GENERAL

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INTRODUCTION.

The book which is offered is the result of a direct and constant demand for the information which it comprehends.

There are many land booklets published, most of which are issued by those firms interested in advertising a certain tract of land in a certain section and the result is that conditions obtaining within those particular localities are not belittled unduly nor is the firm held back in its representations by any ingrowing modesty or backwardness.

The result is that the reader of such lurid, fancy word-painting of the skilled writer of such descriptions is led to the temporary belief, like the reader of the symptoms of a disease as set forth by a patent medicine ad-writer, that he certainly has it now.

This manual has been prepared to set forth clearly and exactly all of the material facts in connection with all of the irrigated lands about which information is obtainable, giving the good points and the bad ones; stating the conditions as they exist briefly and dispassionately, and arranging them comparatively so that the searcher after information may have them before him in concise shape—and so he may have the best benefit therefrom.

The matter has been collected from a variety of authoritative sources and is believed to be exact in all respects. Much of the data has been from information supplied by reports from those in charge of the several projects, or compiled from meritorious publications. That of the Federal projects was supplied by the several Reclamation Project engineers and has been submitted to them for approval as well as to the Director of this Service at Washington.

Many of the State Engineers have also supplied information as to the projects within their borders, and the several railroad systems have likewise furnished full information as to the irrigated lands tributary to their systems.

To all of these and to the several large private irrigation enterprises the writer desires to acknowledge his indebtedness for much of the matter and illustrations herein included.

The completed volume is offered as a manual for the irrigation engineer, expert and most of all for the homeseeker, as to him the book is particularly valuable, for he is the one who searches for a home for himself and his family in a section perhaps far removed from the lands of his fathers, and to such a one information which is exact and unbiased is not only necessary but imperative.

THE REASON



THE work of that branch created under the Department of the Interior of the United States known as the United States Reclamation Service is the natural result of conditions.

Ever since the earliest settlers came from their European homes, there has been a constant and ever-increasing immigration into the United States.

In the beginning these settlers found fertile lands of large area in the forests that then bordered our Atlantic seaboard, and at first this seemingly vast territory was but thinly settled.

The natural increase in population, augmented by new immigrants, soon filled this territory and a search for new lands took the people steadily westward.

Those who remained in the East, cultivated the land and, without thought of the future, ravished it of the nitrogenous elements necessary to the permanent production of vegetable life. As the land became "worn-out," the populace turned to other pursuits and the eastern country, that at one time had been universally agricultural, became a manufacturing or commercial community.

The residents, whose fathers had gained their livelihood from the direct products of the earth, found new channels of employment and as middlemen, through the handling of the products of western lands, secured a margin of profit that enabled them to live.

In the meantime the influx of foreigners has continued and these new hungers must be fed.

The result has been a vastly over-populated East; and the food drains that eastern lands could not supply, were, for a generation or so, borne by the wide stretches of western territory.

This West was so vast that there seemed to be no danger of ever exhausting that which within our own recollection was called the "Manless Land."

It was the policy, at first, to let the settler take as much land as he desired. Subsequently his pre-emption was limited to a section of 640 acres. Then it was found wise to limit it to a homestead of 160 acres and a "Tree Claim" of like amount.

The demand for land continued and the supply of land did not increase. The landless emigrant, in his search for a free home, was joined by the eastern farmer whose lands, because of the constant drain upon them, had become worn out.

So it was that the Government found that it would be necessary to again limit the acreage that might be taken.

Accordingly a further restriction was made so that each citizen might take not more than 160 acres as a homestead. He might not take more naturally-productive land than that upon any basis.

The theory under which this sized tract was allotted was that this amount of land was required to support a family.

Finally it was discovered that virtually all of the arable land was gone and

the farmers, their sons, and hordes of immigrants were clamoring for soil from which to get foods for their children.

Lands became more and more valuable; in some sections doubling several times in price within a generation. The increase in price did not, however, produce more land, instead, it made it but more difficult for the poor man to obtain a farm.

With ten-elevenths of our arable land under high cultivation the Department of the Interior and various syndical enterprises cast about for a solution to supply those who hungered for farms.

It was discovered that, in the country west of the Mississippi, there were a few areas where the soil was very rich and where there was water which might be conveyed to those lands that they, through irrigation, might be made productive.

Accordingly some of the larger and more easily irrigated tracts were selected. At an expense of \$120,000,000 a total of 10,000,000 acres was placed under irrigation.

The average initial cost figured only \$12.00 per acre, and the land so reclaimed produced \$250,000,000 annually, or an average of \$25.00 per acre.

The Reclamation Service then looked for other arable, irrigable territory, and found that such tracts were scarce, the problem of conveying water more expensive, and the area small.

The service has twenty-eight such reclamation projects under way. When completed 1,910,000 acres will be added to our productive areas and the bill will figure \$70,000,000, an average of \$36.65 per acre, or about three times as much as the average cost of the work in the reclamation of the first areas.

This land will be under irrigation by 1911. Then the service will hunt out other tracts and convey water to them, that all land may be placed in the food service of the people.

To gain this end, huge mountains will have to be tunnelled and mighty rivers turned from their beds. The cost of the reclamation will be quadrupled, but the work will be wise because it is of greatest necessity that our food products increase in proportion to our food consumption. In this connection it is almost beyond belief to note the fact of the wonderful and constantly increasing appetite of the earth's peoples.

Statistical information makes clear—casting out the rice crop—that the world's consumption of food has doubled within the last forty years. The earth's population is 1,479,729,400. The increase in population has only averaged 8,000,000 annually, or a total of about 22% in the forty years, hence the deduction that the appetite of the earth's peoples is being constantly augmented is the only solution to the appalling condition.

It is therefore not to be wondered at that Governmental action has been taken to, in part, postpone the time when famine conditions will obtain.

The fear of this condition finds voice in the United States Governmental attitude as regards its allotment of irrigable land. It has been made the rule, in every instance, that no man may own more land than that which will feed an average family. To this end the irrigable farm-unit has been fixed at from 10 to 40 or 80, or in some cases 160 acres. No one holder is permitted to own more than that area of land irrigated under Federal water projects. So far has this idea been carried, that a rancher who already owns lands in one of the project zones, is compelled to dispose of such irrigable acreage as he has in ex-

cess of the "farm-unit," before he is permitted to take any water for the land, that, under the rule established, he may retain. Furthermore his heirs may not inherit his lands, if the result would be that any of them would be possessed of more than the "farm-unit," under the rule.

To insure that the land is taken with a view to immediately make it highly productive and to obviate the danger of having the productive areas held for speculative purposes, the law has been established that the applicant must actually become a resident of the lands he pre-empt. He is required to move onto the lands that he takes, within six months after his application is entered, and remain there constantly for the full term of five or ten years or longer. No commutation under any circumstances is allowed. It is further required that he must, within that period, place a certain percentage of this land under cultivation.

The object is to enforce the highest form of intensive cultivation of these new areas, so that each farm-unit may contribute its quota to appease the appetite of a hungry people. Every law and rule pertaining to the pre-emption of arable lands is framed to that end.

Speculative investment is not only discouraged, but absolutely prevented. The man who desires to make his home on the newly irrigated area of the United States is given every consistent aid by the Federal authorities.

The areas of the project zones are largely in the hands of private individuals. The new settler of these lands is required to purchase them from the owner at the price set by the owner, which is, of course, subject to conditions. In nearly all of the zones there is some public land that may be taken under the homestead laws. Naturally, the public land that is now open to entry, is scarcely as desirable as the land that the earlier settlers took. Having first choice, it was but natural that they should select the very best and most desirable tracts within the area.

There are, however, many farm-units to be had; either by homesteading, or through purchase from present owners, who must, under the laws, dispose of their excess lands before they may take water to irrigate the farm-unit they elect to retain. The cost of these private lands varies from \$25.00 to \$200.00 or more per acre. Public lands may be taken under the Homestead Law. In either instance the settler must buy "water-stock" that represents the proportionate cost of irrigating his acreage.

This "water-stock" varies from \$22.00 to \$75.00 per acre in the different projects. It will average about \$37.00.

The "water-stock" charge is payable in either 5 or 10 annual installments.

There is a further annual charge for the maintenance of the water system that figures from 40 cents to \$2.00 per acre. This charge varies in the different projects in direct ratio with the cost of keeping the irrigating system in proper condition for service. It is a fixed charge that under no circumstances can be neglected. It must go on forever—or so long as the lands are cultivated.

If a settler fails to pay his water assessments his land is subject to lien the same as though he failed to pay his taxes.

In short, the attitude of the Government is to provide land from which the settler, by hard work, may produce a good living for his family.

If the land-seeker wants a "job," it means a good one. If he wants a "position" he had better not waste his time.

There are several large syndical irrigating enterprises on either side of the Mexican border wherein the limit of land, requirements as to residence and

such essential matters in connection with the United States policy are waived. These offer better opportunity for the amassment of large fortunes than any of the Governmental enterprises of the United States, as climatic conditions and the regular supply of water, together with superlative rich soil, make the highest of intensive cultivation a certainty, and the land produces crops twelve months each year. In some of these independent projects the territory controlled and irrigated is very large and the land with water is sold at prices that are relatively very low.

It is the intention of that which follows to cover the pertinent points in connection with each of these several projects so that one who is interested may have comparative information as to all of them before him and so reach a conclusion as to where the future holds best promise for him and for the home of his descendants.

Mention is made of the addresses of those who can supply additional information as it is the province of the writer only to touch upon the essential facts. This treatment will give the homeseeker a clear idea as to each project and he may gain more detailed information as to the one in which he is most interested by writing to the addresses given under each head.

THE MAGNITUDE OF THE U. S. RECLAMATION WORK.

President Roosevelt in his message to the officers and members of the Irrigation Congress held at Boise, Idaho, in September, 1906, thus summarized the work of the Reclamation Service: "The Reclamation Service, consisting of over 400 skilled engineers and experts in various lines, has been organized, and it is now handling the work with rapidity and effectiveness. Construction is already well advanced on twenty-three great enterprises in the arid states and territories. Over 1,000,000 acres of land have been laid out for irrigation, and of this 200,000 acres are now under ditch; 800 miles of canals and ditches and 30,000 feet of tunnel have been completed; and 16,000,000 cubic yards of earth and 3,000,000 cubic yards of rock have been moved. Detailed topographic surveys have been extended over 10,000 square miles of country within which the reclamation work is located, and 20,000 miles of level lines have been run. Three hundred buildings, including offices, and sleeping quarters for workmen, have been erected by the Reclamation Service, and about an equal number by contractors. Over 10,000 men and about 5,000 horses are at present employed."

C. J. Blanchard, Statistician, U. S. Reclamation Service, in an article recently published in The National Geographic Magazine, makes the following

Summary of Work Done.

"A summation of the work of the Reclamation Service for 1907 shows that it has dug 1,881 miles of canals, or nearly the distance from Washington to Idaho. Some of these canals carry whole rivers, like the Truckee River in

Nevada, and the North Platte in Wyoming. The tunnels excavated are 56 in number, and have an aggregate length of $13\frac{1}{2}$ miles. The Service has erected 281 large structures, including the great dams in Nevada and the Minidoka Dam in Idaho, 80 feet high and 650 feet long. It has completed 1,000 head works, flumes, etc. It has built 611 miles of wagon road in the mountainous country and into heretofore inaccessible regions. It has erected and in operation 830 miles of telephones. Its own cement mill has manufactured 80,000 barrels of cement, and the purchased amount is 403,000 barrels. Its own sawmills have cut 3,036,000 feet B. M. of lumber, and 23,685,000 feet have been purchased. The surveying parties of the Service have completed topographic surveys covering 10,970 square miles, an area greater than the combined areas of Massachusetts and Rhode Island. The transit lines had a length of 18,900 linear miles, while the level lines run amount to 24,218 miles, or nearly sufficient to go around the earth.

"The diamond drillings for dam sites and canals amount to 66,749 feet, or more than 12 miles. Today the Service owns and has at work 1,500 horses and mules. It operates 9 locomotives, 611 cars, and 23 miles of railroad, 84 gasoline engines and 70 steam engines. It has constructed and is operating 5 electric light plants. There have been excavated 42,447,000 cubic yards of earth and rock. The equipment now operated by the Service on force account work represents an investment of a million dollars.

"This work has been carried on with the following force: Classified and registered service, including Washington office, 1,126; laborers employed directly by the government, 4,448; laborers employed by contractors, 10,789, or a total of all forces of 16,363. The expenditures now total nearly \$1,000,000 per month. As a result of the operations of the Reclamation Service eight new towns have been established, 100 miles of branch railroads have been constructed, and 14,000 people have taken up their residence in the desert."

General Laws for Homeseekers.

From the publications of the Department of Interior of the United States information is gained how one may secure title to the public lands of the United States.

When the desire is to use the lands for agricultural purposes there are five methods that may be pursued.

Private Entry.

Under this method only certain lands in the State of Missouri may be taken. Lands in all other sections of the United States were, by laws enacted in 1889 and 1891, withdrawn from such method of acquirement.

Pre-emption.

Under this plan one who is eligible may obtain public lands through making settlement upon land subject to pre-emption, by making certain improvements.

He may in this way gain title to not exceed 160 acres and is required to pay to the Government therefor a certain price fixed on land of the character he has taken. This price is a minimum of \$1.25 per acre.

Homestead.

The general law as amended by the act of March 3, 1891, reads:

Every person who is the head of a family, or who has arrived at the age of twenty-one years, and is a citizen of the United States, or who has filed his declaration of intention to become such, as required by the naturalization laws, shall be entitled to enter one quarter section, or a less quantity, of unappropriated public lands, to be located in a body in conformity to the legal subdivisions of the public lands; but no person who is the proprietor of more than one hundred and sixty acres of land in any State or Territory shall acquire any right under the homestead law.

Section 2291 makes it a condition precedent to the issuance of patent that the applicant shall have resided upon and cultivated his entry for a continuous period of five years. He is required to make proof of such residence and cultivation and to pay the usual fees on making final proof at any time after the expiration of said period of five years and before the expiration of two years thereafter.

Homestead entry may be made upon any unappropriated and unreserved public lands, except those governed by special laws, such as mineral, timber, stone, and oil lands. The discovery that land is mineral in character will defeat a homestead entry thereon if the discovery of its mineral character is made at any time before a patent is earned.

Persons Entitled to Take Homesteads.

To be entitled to enter land under the homestead laws the applicant must possess the following qualifications:

(1) He must be a citizen of the United States or have declared his intention to become such under the naturalization laws. Before completing his title he must become such citizen.

(2) He must be of the age of 21 years, or, if not, then he must be the head of a family or have served for at least fourteen days in the Army or Navy of the United States during an actual war.

(3) He must not be the owner of more than 160 acres of land in the United States.

(4) He must not have previously exercised his homestead right, or, if he has he must come within the provisions of some law allowing him to make a second entry.

A deserted wife may make a homestead entry if she becomes the head of a family by having been deserted. If living with her husband, she is disqualified from making any such entry. The entry of a homestead by a single woman is not defeated by her subsequent marriage prior to the completion of her title thereto, but she must still complete the necessary residence and cultivation for the full period of five years. If the man whom she marries has also an uncompleted homestead entry, they must elect which entry they will retain and which they will abandon, as they cannot complete title to both. This follows from the fact that the residence of the wife is the same as that of her husband, and residence can not, therefore, be maintained on both entries.



Reinforced Concrete Pipe—Buford-Trenton Project.

An insane person can not make an entry, but if an entryman becomes insane after having initiated his right to a homestead the necessary proofs to complete title may be made by those appointed to act for him during his disability, providing he has fully complied with the law up to the time he became insane.

Indians who have abandoned their tribal relations may also enter land under the homestead laws without the payment of the fees required of ordinary entrymen. The title acquired, however, is held in trust and is inalienable for twenty-five years, except in certain cases covered by special statute.

Fees and Commissions.

The following tables will show the fees and commissions to be paid by homestead entrymen:

FEES AND COMMISSION TO BE PAID UPON APPLICATION.

| | Land at \$2.50 per acre | Land at \$1.25 per acre |
|--|----------------------------|----------------------------|
| In Alabama, Arkansas, Florida, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota and Wisconsin (Rev. Stat., 2238): | | |
| For 160 acres | \$18.00 | \$14.00 |
| For 80 acres | 9.00 | 7.00 |
| For 40 acres | 7.00 | 6.00 |
| In Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming, (Rev. Stat., Sec. 2238, Par. 12), and the district of Alaska, (Sec. 12, Act May 14, 1898, 30 Stat., 409): | | |
| For 160 acres | 22.00 | 16.00 |
| For 80 acres | 11.00 | 8.00 |
| For 40 acres | 8.00 | 6.50 |

FEES AND COMMISSION TO BE PAID UPON FINAL PROOF

| | | |
|---|---------|---------|
| In Alabama, Arkansas, Florida, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Wisconsin, (Rev. Stat. 2238): | | |
| For 160 acres | \$ 8.00 | \$ 4.00 |
| For 80 acres | 4.00 | 2.00 |
| For 40 acres | 2.00 | 1.00 |
| In Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming, (Rev. Stat., Sec. 2238, Par. 12), and the district of Alaska, (Sec. 12, Act May 14, 1898, 30 Stat., 409): | | |
| For 160 acres | 12.00 | 6.00 |
| For 80 acres | 6.00 | 3.00 |
| For 40 acres | 3.00 | 1.50 |

Desert Land Entry.

One may enter not to exceed 320 acres of arid or desert land providing he is eligible to do so. To gain title he is required to expend at least \$3.00 per acre within a certain period and must pay to the Government in addition \$1.25 per acre. He must also actually have placed one-eighth of the land under cultivation.

Purchase of Isolated Tracts at Public Sale.

Isolated public land that has first been advertised may be purchased at public sale by the highest bidder at a price not less than \$1.25 per acre.

Other Ways.

The foregoing classes represent virtually all the usual ways in which public lands may be acquired.

There are, however, other ways, each covering certain restrictions and all governed by special laws. They are by Credit for Military Service, Transfer and Succession, Soldiers' and Sailors' Entry, Timber and Stone Land Entry, Coal Land Entry, Mineral Entry, Military Bounty Land Warrants and Scrip Locations, State Lands, Land Grants, School Lands and Homesteads Subject to the Reclamation Act.

Homesteads Subject to Reclamation Act.

The act of June 17, 1902 (32 Stat., 388), known as the Reclamation Act, sets aside practically the whole of the proceeds of the sales of public lands for the construction of irrigation works for the reclamation of arid lands, under the direction of the Secretary of the Interior. The primary object is the reclamation and disposal of arid public lands, but the act authorized the disposal of water rights, under the works to be constructed, to holders of land in private ownership. Section 3 of the act authorizes the Secretary of the Interior to withdraw from entry except under the homestead laws, any lands believed to be susceptible of irrigation from said works. It is further provided that all homestead entries made within the areas so withdrawn shall be subject to all the provisions, limitations, charges, terms, and conditions of said act. The tracts to be entered must be made to conform in area to the size of the tract or farm unit which the Secretary, pursuant to the act, shall determine upon as sufficient for the maintenance of a family under the given project—not less than 40 nor more than 160 acres. This determination will not be made until after a full consideration of all the conditions, and if prior to such determination an entry of 160 acres is made within the limits of the withdrawal, the entryman will be compelled to relinquish the portion of his entry in excess of the farm unit. If the land embraced in his entry is susceptible of irrigation from the Government works, he will be compelled to take water right from the Government and to pay for the same in annual installments, not exceeding ten, as fixed by the Secretary of the Interior. The cost of the irrigation works is assessed against the land irrigated, and each entry must bear its due proportion of this cost.

Residence and cultivation are both required, and one-half the irrigable area must be cultivated. Residence must be maintained as in the case of other homesteads, notwithstanding the arid character of the land or the failure to obtain water for irrigation as soon as anticipated. The withdrawal of lands is

no assurance that they will be irrigated under Government works, as such withdrawals are always made in advance of a full determination of the feasibility of the project or of the particular area that can be irrigated. Homesteads under the Reclamation Act can not be commuted.

UNITED STATES LOCAL LAND OFFICES.

| Alabama | Florida | Montana | Oregon |
|------------|-------------|-------------|----------------|
| Montgomery | Gainesville | Billings | Burns |
| | | Bozeman | La Grande |
| | | Glasgow | Lakeview |
| | | Great Falls | Portland |
| | | Helena | Roseburg |
| | | Kalispell | The Dalles |
| | | Lewistown | |
| | | Miles City | |
| | | Missoula | |
| | | | South Dakota |
| | | | Aberdeen |
| | | | Chamberlain |
| | | | Mitchell |
| | | | Piere |
| | | | Rapid City |
| | | | |
| | | | Utah |
| | | | Salt Lake City |
| | | | Vernal |
| | | | |
| | | | Washington |
| | | | North Yakima |
| | | | Olympia |
| | | | Seattle |
| | | | Spokane |
| | | | Vancouver |
| | | | Walla Walla |
| | | | Waterville |
| | | | |
| | | | Wisconsin |
| | | | Wausau |
| | | | |
| | | | Wyoming |
| | | | Buffalo |
| | | | Cheyenne |
| | | | Douglas |
| | | | Evanston |
| | | | Lander |
| | | | Sundance |

Copy of Letter.

DEPARTMENT OF THE INTERIOR,
UNITED STATES RECLAMATION SERVICE.

Washington, D. C., August 11, 1908.

Mr. Charles R. Price,
711 Lankershim Building,
Los Angeles, Cal.

Dear Sir: This office is in receipt of your letter of August 5 asking about the rights of land owners who have paid all water right charges on Reclamation projects.

You are advised that "after the owner has secured good title to both his land and his water" he is not compelled to live upon said lands any longer. Full property rights become vested in him and he may live wherever he desires without forfeiting any right or privilege to the property. He must, however, continue to pay his annual maintenance and operation charges.

Very truly yours,

(Signed) A. E. CHANDLER,
Acting Director.

AN IMPORTANT QUESTION.

The matter of the length of residence required by the United States Government on irrigated land reclaimed by Federal projects, should be explained more thoroughly than is made clear by the general information usually given out.

Upon other pages of this book, copies of letters are printed giving the decisions of the Department of the Interior, both from the General Land Office and the Acting Director of the United States Reclamation Service, making clear that the entryman may reside where he will and still be protected in the title, which he has gained to his homestead, after patent has passed to him.

It must be understood, however, that while this is the general law, the Reclamation Service has adopted the policy of enforcing that the applicant become a member of the local Water Users' Association, before he can obtain a water right. These Water Users' Associations have their own rules and conditions and in many of these associations the members are required to agree to live upon and cultivate the lands for a longer time than is required to gain a patent thereto. In some cases constant residence is so required, therefore it is most advisable for the applicant to be thoroughly posted as to the rules and by-laws of the local Water Users' Association before he makes formal application for his land and water right. In short, he should make it a point to become fully advised of the conditions imposed by the Water Users' Association in connection with the project that he has under consideration, and by so doing, have full information as to just what additional conditions and restrictions are placed upon him by such Water Users' Association.

In order that he may have knowledge of the relation of these Water Users' Associations to the Reclamation Service, the following publication of the Department of the Interior which is issued by the United States Reclamation Service is appended:

7—531.

DEPARTMENT OF THE INTERIOR
UNITED STATES RECLAMATION SERVICE.

Questions and Answers Relating to the Reclamation Act and Its Operations.

The following questions and answers have been prepared for convenience in replying to correspondents who seek information concerning the Reclamation Act and the operations under it.

The law is general in character and leaves details to executive discretion. Many important questions will not be decided until actual cases are brought to the attention of the Department, as it is not customary in governmental affairs to give decisions in advance of the necessities of the case. Further, while the law authorizes the Secretary of the Interior to promulgate rules and regulations, it has not been deemed wise to attempt to make these cover future contingencies, but to permit progress to be made under the general conceptions of the law and not to run the risk of hampering the work by attempting to give definite instructions too far in advance; thus only such matters are passed on as are necessary for current business.

The questions given are such as are asked by most correspondents. The answers are based upon present conceptions of the law and its requirements, and are, in some cases, not necessarily final; it is possible that in the future some of them will be modified or reversed.

F. H. NEWELL, Director.

Homestead Entries

1. Q. In what way can public land be taken under the Reclamation Act?

A. The only way in which land can be taken is under the terms of the homestead law, which requires actual residence and cultivation.

2. Q. Can I take up a homestead under the Reclamation Act, and obtain title when I am earning a living in a nearby city?

A. You cannot obtain a homestead unless you live on the land and make it your home. Occasional absence is allowable, if some good reason is given, but you can not live elsewhere and claim a homestead.

3. Q. Is it necessary for me to live on the land more than once in six months?

A. Yes; actual and continuous residence is required by law; you must establish your home on the land and live there for the full term required.

4. Q. Must I move onto the land at once?

A. You are given six months from the time of making your entry to establish residence, and before the end of that time you must be actually living on the ground.

5. Q. Is it sufficient to erect an ordinary claim shanty, with one door and window?

A. No; the claim shanty and nominal residence which may have sufficed under some conditions will not be sufficient on the irrigable land. An actual home, where you sleep and take your meals habitually, will be required.

6. Q. Can I enter 160 acres and then sell off parts of it?

A. You can obtain title only to a certain piece of land, which may be from 10 to 160 acres, and you can not convey any title to this or to any portion of it until final certificate has issued for your entry. You may relinquish or give up a portion of it, and in that event some other person can make a new homestead entry, but you can not transfer to him any rights or privileges, and he must begin his term of residence as required in the case of a new entry.

7. Q. Must I live on the land if the water is not available?

A. Yes; after you make your homestead entry you must comply with the terms of the homestead law. No excuse will be accepted because of lack of water; if lands are entered before water is ready there is a presumption that the person making the entry does it for speculative purposes rather than for an actual home.

8. Q. How much land can I enter at first?

A. Under usual conditions there is no law to prevent your entering 160 acres at first; but this entry is merely preliminary, and will be cut down to from 10 to 120 acres, according to the plans finally determined upon. The entry will be subject to certain limitations, charges, and terms, which can not be stated until announced by the Secretary of the Interior.

9. Q. When can I ascertain the limit for which water may be obtained under a project.

A. Under Section 4 of the Reclamation Act the Secretary of the Interior will give public notice of the lands irrigable and limit of area per entry "which limit shall represent the acreage which, in the opinion of the Secretary, may be reasonably required for the support of a family upon the lands in question." This notice is usually given during the season preceding that during which water is to be furnished.

10. Q. What assurance is there that the land which I enter will be irrigated?

A. You can have no assurance that the land will be irrigated until public notice has been given. If you enter in advance of the public notice you make a speculative entry, wholly at your own risk, and without any guaranty or safeguard that water will be supplied, and with a reasonable probability that you may lose your homestead right.

11. Q. How will notice be given?

A. Through the public press. When the adjustment of entries to the farm units is necessary the register and receiver of the local land office will give notice by posting in the local land office, by publication, and by mailing special notice by registered mail to every person who may have made entry during the period of withdrawal, requiring him to adjust his entry to the farm unit.

12. Q. If a homestead entry is made before the issuance of the public notice as to area of the farm unit, will the entryman be permitted to prove up as to the entire tract?

A. No. When the farm unit is established notice will be sent to the various entrymen, informing them of the fact, and that they will be required to

cut down their holdings to the limit decided upon by the Secretary of the Interior as sufficient for the support of a family, and giving them the option of selecting such part of the land as they may prefer and amending their entries accordingly; or in case they fail to make such selection the United States will make it for them and cancel the remainder of the entry.

13. Q. Where the entryman is in default as to payment of any annual installment, will his relinquishment relieve the land of the charges against it?

A. No; the annual charge is not a rental obligation, and a succeeding entryman takes the land burdened with whatever charges may have been duly levied against it and not paid or discharged by his predecessor.

14. Q. What is the effect of a relinquishment of an entry made under the Reclamation Act?

A. The cancellation of an entry, whether by relinquishment or otherwise, carries with it a forfeiture of all claim to the water right. When the land is re-entered the water right that is appurtenant to the land inures to the second entryman, who is obliged to pay all charges then due or afterwards apportioned against the tract.

15. Q. What are farm unit plats?

A. Farm unit plats are township plats approved by the Secretary of the Interior, showing the subdivision of land under reclamation projects, and the number of acres of irrigable land contained in each farm unit or separate tract of private land. They will be on file at the local land offices and at the offices of the Reclamation Service, after the issuance of the public notice provided by the Reclamation Act.

16. Q. How much water will be furnished for the land?

A. Such amount as may be available from the works controlled by the United States not to exceed the amount necessary for the proper irrigation of the same. The quantity will be duly announced for each project when the Secretary of the Interior gives the public notice under section 4 of the act. For further details on this point see answers to Questions 27-33.

DESERT LANDS.

17. Q. May a desert-land entryman or his assignee apply for a Government water right?

A. Yes; but he must live on the land or in the neighborhood and relinquish to the United States any land in the entry exceeding 160 acres.

18. Q. Will the time for making final proof on desert-land entries be extended?

A. Yes; his entry becomes subject to the provisions of the Reclamation Act as to residence, payments, etc.

WATER USERS' ASSOCIATION.

Duties and Powers.

19. Q. What are water users' associations?

A. They are associations of individuals claiming the right to the use of water and owning lands within the area to be supplied by the works constructed by the Government.

20. Q. Why are the associations formed?

A. They are formed in order to assure the Government that the landowners

will apply for water from the irrigation works, and that they will so adjust the existing claims to the use of water that the administration of all the water available for the lands under the project, whether supplied from private or from Government irrigation works, shall be under one control, viz., that of the water users themselves. This organization is necessary, in order that there may be supervision over the distribution of water to lands in private ownership, as contemplated by section 6 of the Reclamation Act.

21. Q. What is the form of organization?

A. The form of organization may vary in different parts of the country in accordance with local needs. A general form has been prepared which can be used in organizing such associations. Its principles have been approved by the Secretary of the Interior.

22. Q. What is required of persons joining such associations?

A. (1) They agree to turn over to the management of the association the water which they have heretofore appropriated, to be administered in connection with the additional water supply furnished from the Government irrigation system. (2) They agree to make their former water-rights, as well as the Government water-rights, appurtenant to the lands irrigated. (3) They agree to pay the charges for water-rights required by the Reclamation Act. (4) They agree that their land shall be security for the Government charge for water, and that such charges shall be a lien on the land which the association may enforce if they do not pay for the water. (5) They agree to dispose of the lands they own in excess of the limit of land in private ownership permitted to apply for water from the Government system.

23. Q. How is this association managed?

A. Directly by the water users themselves and through the officers elected by them.

24. Q. What is the connection between the association and the Government?

A. Before beginning construction the Government makes a contract with the association in which the latter guarantees the payment for the Government construction and agrees to enforce collection from its shareholders, by means of the lien on their land if necessary.

25. Q. Does the shareholder derive any advantage from this lien?

A. Yes; it protects him against the possibility of being required to pay for a shiftless neighbor's water-right, for without the lien the association would be required to assess each member for any deficiency.

26. Q. What is the form of organization contemplated by section 6 of the act, to which the management and operation of the irrigation system is to be turned over when the payments have been made for the major portion of the lands irrigated?

A. This can not be decided until such period approaches in the first project to be completed. The form of water users' association already discussed will probably meet the necessary requirements. In any event it will require few, if any changes to meet the conditions contemplated in section 6.

Water Supply.

27. Q. How much water will be furnished to each water user?

A. He will receive his proportional part of the entire supply in the hands

of the association, not in excess of the amount necessary for the proper cultivation of his land.

28. Q. What assurance has he of a sufficient supply?

A. The association is required to limit the land represented by its shares to the area which the Government has determined can be cultivated to the highest efficiency.

29. Q. What will be the cost of the Government water right?

A. The smallest amount consistent with permanent work. Steel and concrete will be used where required. The largest part of the cost of an ordinary irrigation system—that is, the maintenance, which goes on forever—will be reduced to a minimum.

30. Q. How are former water rights affected by joining the association?

A. The Reclamation Act expressly protects vested water rights. By joining the association the owner of such water rights puts them in the care of the association and the water is to be delivered to him as before, being included in the complete supply furnished from the Government system. His priority of water rights remains intact, is protected by the articles of the association, and may be reasserted if ever there should be a shortage of water in the future.

31. Q. How are such prior water rights to be protected if the need should arise fifty years hence?

A. These rights must be definitely ascertained and made a matter of record as soon as the association can have the adjustment made. This adjustment can be made by mutual agreement or in the courts.

Stock Subscription.

32. Q. If a tract to be subscribed for contains lands which are not irrigable, how many acres should be included?

A. The subscription should include the entire tract. The Secretary of the Interior will, by careful and expert examination, determine the irrigable area of each tract. The shares representing non-irrigable lands will be canceled and the Government will make no charges against them.

33. Q. Can a man subscribe for a part of his land and leave the rest out of the irrigation system?

A. No; the association will accept subscriptions only when they cover the entire body of the land owned by the subscriber within the project. No single subscription should exceed 160 shares, but any person may make several subscriptions if he agrees to dispose of his excess lands located under the system.

LANDS IN PRIVATE OWNERSHIP.

Water Rights and Residence.

34. Q. What is meant by "land in private ownership" as used in the act?

A. This includes all land which was not public at the date of withdrawal under the Reclamation Act, or which was then covered by entry and afterwards canceled. The Secretary of the Interior has held that for the purposes of this act a desert-land entry may be classed as land in private ownership; a homestead entry not made under the Reclamation Act will be classed similarly. The applicant for a water right for land in private ownership must state accurately upon the proper form the nature of his interest in the land. This interest must be such that it can ripen into a perfect title at or before the time when the last annual installment of the water right is due.

35. Q. If I own a tract of land to which water may be brought by a Government ditch, how can I obtain a water right?
- A. It will be necessary to become a member of the local water users' association and subscribe to all the requirements of membership in such association, and afterwards to make application to the Government for a water right when it is ready to receive such.
36. Q. How is it determined whether or not an applicant for a water right for land in private ownership has such an interest in the land that his application can be accepted?
- A. He must state accurately, upon the proper form, the nature of his interest in the land. If this interest is such that it can ripen into a perfect title, at or before the time when the last annual installment of the water right is due, the application may be received.
37. Q. What assurance is there that he has correctly stated the nature of his title?
- A. The fact that the records are open to examination at any time, and also that his water right would be subject to contest, and if fraud or bad faith be proved he will lose the water right and all money he has paid on it.
38. Q. Should an abstract of title of ownership of an irrigable tract be filed before an application is made for water right?
- A. An abstract is not required by the United States, but may be required by the Water Users' Association for its protection. The application for water right contains a certificate covering the question of ownership, and this is sufficient for the purpose of making application, leaving the right open to contest if his title to the land is not good. The water right is subject to cancellation and loss of all money paid if he has not good title when the last payment is due.
39. Q. For what amount of land can water be had?
- A. Section 5 of the law states that no right to the use of water for lands in private ownership shall be sold for a tract exceeding 160 acres to any one land owner.
40. Q. Can I obtain water for a full tract of 160 acres?
- A. This matter is left to the Secretary of the Interior, and the acreage may, in his discretion, be reduced to 120, 80, or a less area, according to the surrounding conditions.
41. Q. Why cannot water be had for more than 160 acres?
- A. The object of the law is not merely to reclaim the land, but to encourage the establishment of homes by the greatest number of persons, and to bring about an intensive cultivation of the soil. It is necessary to cut down the landholdings to such a point as will enable a large number of families to make a comfortable living.
42. Q. Can I, while residing in some other locality, where I am earning a living, obtain water for a tract of land?
- A. You can not obtain a water right for your land unless you are an actual bona-fide resident on such land or occupant thereof residing in the neighborhood.
43. Q. What is meant by "the neighborhood?"
- A. That a person must live within such distance of the land that he can daily cultivate or care for it. This provision, relating to an occupant residing in the neighborhood, was drawn originally with reference to the condition in

Utah, where the farmers live in small communities and cultivate farms surrounding the villages. In this case the farms are all within an easy drive of the homes of the owners. The maximum limit of distance for which residence will be considered as being in the neighborhood of the land is 20 miles.

44. Q. If I have a farm of over 160 acres for which I want water, what must I do?

A. You can, by joining the Water Users' Association, and afterwards applying to the Government, secure water for 160 acres or less, as the rule may be; but the remainder of the land can not have water unless it is conveyed by a deed duly recorded to some other person.

45. Q. Can I convey this to a relative or friend, and can he obtain water and then transfer the title back to me?

A. To secure a title to the water-right the land must be conveyed by a deed duly recorded and remain in the ownership of some other person for five years or more. Such person must also be an actual bona-fide resident on the land or an occupant thereof residing in the neighborhood.

46. Q. Assuming that a man has 320 acres, what steps should he take?

A. He can make application to the register and receiver of the local land office for water-right for 160 acres, etc., etc. He should then dispose of the 160 acres, according to his agreement with the association, and if this is not done steps should be taken to enforce the agreement.

47. Q. Who will look after this matter and see that the application is made?

A. All of these details should be looked after by the superintendent of irrigation, who will obtain the necessary facts from the land office, and see that proper steps are taken to secure the transfer of the land and the proper application for water.

48. Q. Suppose that a man now takes the first installment to the land office, what procedure would follow?

A. The receiver of public moneys would refuse to receive the money on the ground that the preliminaries required by law have not been complied with, namely, the Secretary has not made definite announcement of the amount of water and charge per acre, the number of installments, etc. All of these must be reported to the Washington office, to be submitted to the Secretary for his action, before the land office can be properly notified.

49. Q. If I own a piece of land and put a tenant upon it, will not this comply with the requirements of the law?

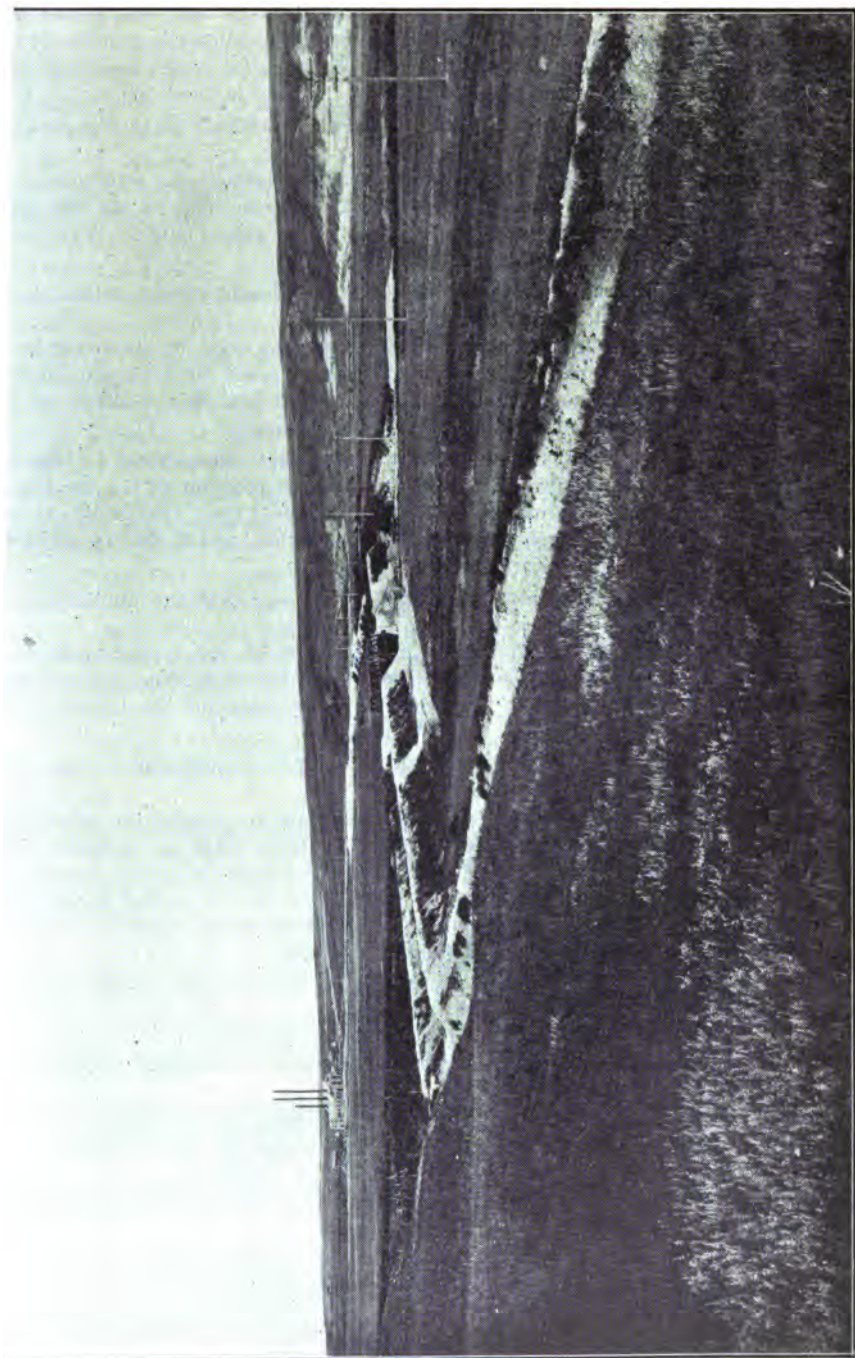
A. No; the law is explicit that the landowner shall be an actual bona-fide owner and resident. It is not the purpose of the law to encourage landlordism or tenantry.

50. Q. If there are several children in the family, can the land be deeded in separate tracts to each of these children and water be thus secured?

A. This might be done if each individual is competent to be an independent landowner, but he must have title of record in fee and have an actual residence upon the land or in the neighborhood.

51. Q. What can be done in case of a man owning several hundred or thousand acres, or a trust company having large tracts?

A. Unless the person is an actual resident and occupant of the soil he cannot obtain any water rights, and the land must be left without any water



Williston Project, North Dakota. Power Plant in Distance.

supply unless it is conveyed to an actual bona-fide resident, who may then apply for water.

52. Q. Can not any arrangements be made pending the time of disposal of the land?

A. Subscriptions will be received by the local water users' association, and the land can ultimately receive water when subdivided and sold.

53. Q. How can these lands be sold?

A. The owner can sell at his own discretion; but he must by trust deed to the association give it power to sell ultimately in small tracts to actual settlers who are qualified to comply with the Reclamation Act, unless this has been done by him when the Government is ready to furnish the water.

54. Q. If I have made a homestead entry under the Reclamation Act for 160 acres, and the farm unit is made, say, 40 acres, may I execute an excess holding contract for the remainder?

A. The homestead entryman can not execute an excess holding contract with a water users' association, as he has at this stage of his entry no title to the land. He must amend his entry as required by the instructions.

55. Q. How soon must a man dispose of his excess land?

A. He will not be required to do so before the Government is ready to furnish the water, thus gaining the benefit of advanced prices resulting from the large expenditures of the Government and the sure prospect of water, and having without expense a good market for his land that he could have had under no other conditions.

56. Q. What is done to make certain that such excess lands are sold?

A. The owner must agree that if he does not sell them to a properly qualified person by the time the Government water is ready the water users' association shall have power to do so.

57. Q. Will the lands be sacrificed by the association?

A. No; for three reasons: (1) Every officer and member of the association is a landowner, and a depreciation of land values is against his interest. (2) The time for making the sale is fixed by the Secretary of the Interior, who will give due consideration to the interests of all concerned. (3) The demand for land becomes so great, as construction approaches completion, that large prices can be easily realized by the owner himself, and there will be little, if any land to be sold by the association.

Railroad Lands.

58. Q. In the case of railroad lands, what arrangements can be made?

A. The railroads, as a rule, have agreed to put their lands on the market in small tracts, at a price of \$1.25 or \$2.50 per acre, to be sold on long-time payments, and subject to all of the conditions of Government land adjoining, title not to be passed until all of the terms have been complied with.

59. Q. What is the inducement to the railroads to dispose of lands in this manner?

A. The railroad corporations are more interested in securing immediate settlement and cultivation in small tracts than in obtaining a profit on the land; and in this respect their object and that of the Government is identical, viz., to bring about immediate settlement by the maximum population on the irrigated tract.

Sale or Mortgage.

60. Q. Suppose that I sell a piece of land, take a mortgage on it, and before the water right has been paid in full foreclose the mortgage and take the land, will not the title to water remain with the land?

A. No. You can not complete the right to the use of water unless you afterwards live upon the land and have not applied for water right for other lands in excess of the limit fixed.

61. Q. How will these conditions be enforced?

A. By the articles of incorporation and by-laws of the Water Users' Association, that body being responsible for enforcement of the law as to its shareholders; also by contest before the land office or through exercise of the power vested in the Secretary of the Interior.

62. Q. If a person trying to acquire a water right sells his land, or if he dies, does this forfeit the water right partly acquired?

A. Forfeiture does not necessarily follow, but the land must come into the hands of a person who will live upon the land, and who is otherwise qualified, and who does not already own rights to water for other lands.

63. Q. How will the cost of the water right be announced?

A. By public notice required by section 4, in which the Secretary will state the estimated cost of construction in two parts (a) the building charge and (b) the operation and maintenance charge.

OPERATION AND MAINTENANCE.

64. Q. How will the operation and maintenance charge be fixed?

A. During the first few years it will be a flat charge per acre over all the land under ditch. As soon as the necessary facts become known the charge will be proportional to the amount of water used with a minimum flat charge per acre, which must be paid for every acre under ditch, whether or not water is used thereon.

65. Q. When are the amounts for building charge and for operation and maintenance to be paid?

A. The Secretary of the Interior will announce the date of first payment in the public notice issued for each project.

66. Q. Can a man avoid payment by not taking water?

A. No. Every acre under ditch must pay the building charge, also the operation and maintenance charge beginning with the first season in which water is ready for delivery, and must continue to pay the proper charges each year, no matter whether water is used on the land or not.

67. Q. What will be the result if payment is not made when due?

A. No more water will be delivered. The Water Users' Association will enforce its lien as to private lands in order to meet its guaranty to the United States. The water-right application will be canceled when the second payment is overdue, and the money which had been paid thereon will be forfeited to the United States. If the water-right application is based on a homestead entry, the entry will be canceled at the same time.

DISTRIBUTING SYSTEM.

68. Q. To what extent is the distributing system built by the Government?

A. The main canals and main laterals are built by the Government to a point from which water can be conveniently delivered through sublaterals to the farm units.

69. Q. By whom are the sublaterals built?

A. The sublaterals, as a rule, are built by the individual water users, acting singly or in groups of a few individuals.

70. Q. How long are these sublaterals?

A. As a rule, the sublaterals are less than a mile in length. In some cases the water can be taken directly to the land from the main distributing system; in others short sublaterals will be built by one or more water users; and in others it is necessary for several water users to join together to build sublaterals a mile or even more in length.

71. Q. How are these sublaterals located?

A. The Government engineers lay out the scheme of distribution and stake out on the ground the location of the sublaterals. These must be built in accordance with plans approved by the engineers.

72. Q. In what way can the Government assure that these sublaterals will be built?

A. The water will not be turned to the land unless the sublaterals are built as prescribed by the engineers.

73. Q. How are these sublaterals maintained and kept cleaned and effective?

A. The water users must bear the expense of keeping the sublaterals leading to their lands in good condition, so that water is not wasted, under penalty of having the supply cut off.

74. Q. How if some one man neglects, or refuses to bear his share of the expense?

A. He will receive no water until he pays his share.

75. Q. Who will see that the work of maintaining sublaterals is properly done?

A. The engineers of the Reclamation Service and the Water Users' Associations. The associations, under their by-laws, are authorized to do the work and charge the cost against the land, and no water will be delivered unless the charges are paid when due. If there is no Water Users' Association, special arrangements will be made to accomplish the same result.

K. 149385-1908.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE.

Washington, D. C., August 17, 1908.

Mr. Chas. R. Price,

711 Lankershim Building, Los Angeles, California.

Sir:—In response to your letter of August 5, 1908, I have to advise you that after an entryman has complied with the provisions of the homestead law as to residence, cultivation and improvements, no additional residence is required by the reclamation act, and entryman may reside where he will and still be able to comply with the additional requirements imposed by said act.

I enclose herewith a form of letter which is used by this office in accepting five year proofs submitted on reclamation homestead entries.

Very respectfully,

ADH

FRED DENNETT, Commissioner.

4-331.

DEPARTMENT OF THE INTERIOR.
GENERAL LAND OFFICE.

Washington, D. C.

(Through Register and Receiver,)

Sir:—You are advised that the five-year proof submitted by you on Homestead Entry, No., made subject to the Act of June 17, 1902 (32 Stat., 388), for the Section, Township Range, Meridian, has been examined in this office and is found to be sufficient as to residence, cultivation, and improvements, as required by the ordinary provisions of the homestead law. Further residence on the land is not required.

No patent will issue hereunder. Final certificate and patent will issue only upon proof that at least one-half of the irrigable area in the entry, as finally adjusted, has been reclaimed, and when all the charges, fees, and commissions due on account thereof have been paid to the Receiver of the proper local land office.

Very respectfully,

FRED DENNETT, Commissioner.

PROVISIONS OF THE RECLAMATION ACT.

1. The withdrawal of lands under the provisions of the Reclamation Act of June 17, 1902 (32 Stat. L., p. 388), a copy of which is appended, is principally for the purpose of making the extensive surveys and careful engineering investigations necessary to determine the feasibility of any particular irrigation project. Even if the project is feasible, only a portion of the lands withdrawn will be irrigated. The mere fact that surveys are in progress is no indication whatever that the works will be built. Until the surveys have been completed, it will be impossible to state how much water will be available, what lands will be watered, or whether the cost will be too great to justify the undertaking.

2. The Secretary of the Interior will at the proper time, as provided in section 4, announce the area of lands which may be embraced in any entry thereafter made or which may be retained in any entry theretofore made under the reclamation act, and will determine and fix the charges which shall be made per acre for the lands embraced in such entries for the estimated cost for building the works and for operation and maintenance, and prescribe the number and amount and the dates of payment of the annual installments thereof.

3. Until this public notice has been issued by the Secretary of the Interior, it will be impossible to give information concerning any particular tract or any of the details required by the public notice.

4. Homestead entries may be made for the lands withdrawn as irrigable under this act in accordance with the general laws and regulations relating to this class of entries. All the public lands under an irrigation project will be divided into farm units containing such area of irrigable land as, in the opinion of the Secretary of the Interior, will be necessary for the support of a family. These areas may vary in any one project from 10 acres to 160 acres, in accordance with the character of the soil and the relation of the lands to the irrigation system. Each farm unit will contain as nearly as possible the same average amount of irrigable land suitably situated for irrigation.

5. The entries are not subject to the commutation provisions of the homestead laws.

6. Actual and continuous residence on the land is required, in accordance with the homestead laws.

7. The entryman will be required to take water from the Government irrigation system and to pay in annual installments, not exceeding ten, the proportionate amount charged against the land included in his entry.

8. Before being entitled to a patent for the land, the entryman must pay the entire charges for the water, and must show that he has reclaimed at least one-half the total irrigable area of his entry for agricultural purposes.

9. A failure to make any two payments when due shall render the entry subject to cancellation, with the forfeiture of all rights under the act, as well as all money paid thereon.

10. Until the construction of the irrigation system has advanced to such an extent that water can be furnished for the irrigation of the lands, it will be difficult, if not impossible, to make a living upon them; but those filing will not, on that account, be excused from residing thereon, the homestead laws requiring that actual bona fide residence be established within six months from the date of the filing of the applications, and continuously maintained.

11. Failure to comply in good faith with the provisions of the law concerning residence will render the entry subject to cancellation.

12. For specific instructions concerning the modification of the homestead laws as applicable to entries under the Reclamation Act see General Land Office Circular of January 18, 1908. Except where modified by the terms of this act the entries will be made in accordance with the general rulings concerning the homestead laws. Information concerning them can be obtained from the circulars issued by the General Land Office.

RECLAMATION ACT.

An Act Appropriating the receipts from the sale and disposal of public lands in certain States and Territories to the construction of irrigation works for the reclamation of arid lands.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That all moneys received from the sale and disposal of public lands in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming, beginning with the fiscal year ending June thirtieth, nineteen hundred and one, including the surplus of fees and commissions in excess of allowances to registers and receivers, and excepting the five per centum of the proceeds of the sales of public lands in the above States set aside by law for educational and other purposes, shall be, and the same are hereby, reserved, set aside, and appropriated as a special fund in the Treasury to be known as the "reclamation fund," to be used in the examination and survey for and the construction and maintenance of irrigation works for the storage, diversion and development of waters for the reclamation of arid and semi-arid lands in the said States and Territories, and for the payment of all other expenditures provided for in this Act: Provided, That in case the receipts from the sale and disposal of public lands other than those realized from the sale and disposal of lands referred to in this section are insufficient to meet the requirements for the support of agricultural colleges in the several States and Territories, under the Act of August thirtieth, eighteen hundred and ninety, entitled "An act to apply a portion of the proceeds of the public lands to the more complete endowment and support of the colleges for the benefit of agriculture and the mechanic arts, established under the provisions of an Act of Congress approved July second, eighteen hundred and sixty-two," the deficiency, if any, in the sum necessary for the support of the said colleges shall be provided for from any moneys in the Treasury not otherwise appropriated.

Sec. 2. That the Secretary of the Interior is hereby authorized and directed to make examinations and surveys for, and to locate and construct, as herein provided, irrigation works for the storage, diversion and development of waters, including artesian wells, and to report to Congress at the beginning of each regular session as to the results of such examinations and surveys, giving estimates of cost of all contemplated works, the quantity and location of the lands which can be irrigated therefrom, and all facts relative to the practicability of each irrigation project; also the cost of works in process of construction, as well as of those which have been completed.

Sec. 3. That the Secretary of the Interior shall, before giving the public notice provided for in section four of this Act, withdraw from public entry the lands required for any irrigation works contemplated under the provisions of

this Act, and shall restore to public entry any of the lands so withdrawn when, in his judgment, such lands are not required for the purposes of this Act; and the Secretary of the Interior is hereby authorized, at or immediately prior to the time of beginning the surveys for any contemplated irrigation works, to withdraw from entry, except under the homestead laws, any public lands believed to be susceptible of irrigation from said works: Provided, That all lands entered and entries made under the homestead laws within areas so withdrawn during such withdrawal shall be subject to all the provisions, limitations, charges, terms and conditions of this Act; that said surveys shall be prosecuted diligently to completion, and upon the completion thereof and of the necessary maps, plans, and estimates of cost, the Secretary of the Interior shall determine whether or not said project is practicable and advisable, and if determined to be impracticable or unadvisable he shall thereupon restore said lands to entry; that public lands which it is proposed to irrigate by means of any contemplated works shall be subject to entry only under the provisions of the homestead laws in tracts of not less than forty nor more than one hundred and sixty acres, and shall be subject to the limitations, charges, terms, and conditions herein provided: Provided, That the commutation provisions of the homestead laws shall not apply to entries made under this Act.

Sec. 4. That upon the determination by the Secretary of the Interior that any irrigation project is practicable, he may cause to be let contracts for the construction of the same, in such portions or sections as it may be practicable to construct and complete as parts of the whole project, providing the necessary funds for such portions or sections are available in the reclamation fund, and thereupon he shall give public notice of the lands irrigable under such project and limit of area per entry, which limit shall represent the acreage which, in the opinion of the Secretary, may be reasonably required for the support of a family upon the lands in question; also of the charges which shall be made per acre upon the said entries, and upon lands in private ownership which may be irrigated by the waters of the said irrigation project, and the number of annual installments, not exceeding ten, in which such charges shall be paid and the time when such payments shall commence: The said charges shall be determined with a view of returning to the reclamation fund the estimated cost of construction of the project, and shall be apportioned equitably: Provided, That in all construction work, eight hours shall constitute a day's work, and no Mongolian labor shall be employed thereon.

Sec. 5. That the entryman upon lands to be irrigated by such works shall, in addition to compliance with the homestead laws, reclaim at least one-half of the total irrigable area of his entry for agricultural purposes, and before receiving patent for the lands covered by his entry shall pay to the Government the charges apportioned against such tract, as provided in section four. No right to the use of water for land in private ownership shall be sold for a tract exceeding one hundred and sixty acres to any one landowner, and no such sale shall be made to any landowner unless he be an actual bona fide resident on such land, or occupant thereof residing in the neighborhood of said land, and no such right shall permanently attach until all payments therefor are made. The annual installments shall be paid to the receiver of the local land office of the district in which the land is situated, and a failure to make any two payments when due shall render the entry subject to cancellation, with the forfeiture of

all rights under this Act, as well as of any moneys already paid thereon. All moneys received from the above sources shall be paid into the reclamation fund. Registers and receivers shall be allowed the usual commissions on all moneys paid for lands entered under this Act.

Sec. 6. That the Secretary of the Interior is hereby authorized and directed to use the reclamation fund for the operation and maintenance of all reservoirs and irrigation works constructed under the provision of this Act: Provided, That when the payments required by this Act are made for the major portion of the lands irrigated from the waters of any of the works herein provided for, then the management and operation of such irrigation works shall pass to the owners of the lands irrigated thereby, to be maintained at their expense under such form of organization and under such rules and regulations as may be acceptable to the Secretary of the Interior: Provided, That the title to and the management and operation of the reservoirs and the works necessary for their protection and operation shall remain in the Government until otherwise provided by Congress.

Sec. 7. That where in carrying out the provisions of this Act it becomes necessary to acquire any rights or property, the Secretary of the Interior is hereby authorized to acquire the same for the United States by purchase or by condemnation under judicial process, and to pay from the reclamation fund the sums which may be needed for that purpose, and it shall be the duty of the Attorney-General of the United States upon every application of the Secretary of the Interior, under this Act, to cause proceedings to be commenced for condemnation within thirty days from the receipt of the application at the Department of Justice.

Sec. 8. That nothing in this Act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any State or Territory relating to the control, appropriation, use or distribution of water used in irrigation, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this Act, shall proceed in conformity with such laws, and nothing herein shall in any way affect any right of any State or of the Federal Government or of any landowner, appropriator, or user of water in, to, or from any interstate stream or the waters thereof: Provided, That the right to the use of water acquired under the provisions of this Act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right.

Sec. 9. That it is hereby declared to be the duty of the Secretary of the Interior in carrying out the provisions of this Act, as far as the same may be practicable and subject to the existence of feasible irrigation projects, to expend the major portion of the funds arising from the sale of public lands within each State and Territory hereinbefore named for the benefit of arid and semi-arid lands within the limits of such State or Territory. Provided, That the Secretary may temporarily use such portion of said funds for the benefit of arid or semi-arid lands in any particular State or Territory hereinbefore named as he may deem advisable, but when so used the excess shall be restored to the fund as soon as practicable, to the end that ultimately, and in any event, within each ten-year period after the passage of this Act, the expenditures for the benefit of the said States and Territories shall be equalized according to the proportions and subject to the conditions as to practicability and feasibility aforesaid.

Sec. 10. That the Secretary of the Interior is hereby authorized to perform any and all acts and to make such rules and regulations as may be necessary and proper for the purpose of carrying the provisions of this Act into full force and effect. (32 Stat. L., 388.)

Approved, June 17, 1902.

THE CAREY ACT.

Adopted June 10, 1905.

Section 4 of the Act of Congress, approved August 18, 1894, entitled, "An Act Making Appropriations for Sundry Civil Expenses of the Government for the Fiscal Year Ending June 30, 1895, and for Other Purposes" (28 Stat., 372-422), authorizes the Secretary of the Interior, with the approval of the President, to contract and agree to patent to the states of Washington, Oregon, California, Nevada, Idaho, Montana, Wyoming, Colorado, North Dakota, South Dakota and Utah, or any other states, as provided in the act, in which may be found desert lands, not to exceed 1,000,000 acres of such lands to each state, under certain conditions.

The text of the act is as follows:

"That to aid the public land states in the reclamation of the desert lands therein, and the settlement, cultivation and sale thereof, in small tracts to actual settlers, the Secretary of the Interior with the approval of the President, be, and hereby is, authorized and empowered, upon proper application of the state, to contract and agree, from time to time, in each of the states in which there may be situated desert lands as defined by the act entitled, 'An Act to Provide for the Sale of Desert Land in Certain States and Territories,' approved March third, eighteen hundred and seventy-seven, and the act amendatory thereof, approved March third, eighteen hundred and ninety-one, binding the United States to donate, grant and patent to the state free of cost for survey or price such desert lands, not exceeding one million acres in each state, as the state may cause to be irrigated, reclaimed, occupied, and not less than twenty acres of each one hundred and sixty acre tracts cultivated by actual settlers, within ten years next after the passage of this act, as thoroughly as is required of citizens who may enter under the desert land law.

"Before the application of any state is allowed, or any contract or agreement is executed, or any segregation of any of the land is ordered by the Secretary of the Interior, the state shall file a map of the said land proposed to be irrigated, which shall exhibit a plan showing the mode of the contemplated irrigation and which plan shall be sufficient to thoroughly irrigate and reclaim said land and prepare it to raise ordinary agricultural crops, and shall also show the source of the water to be used for irrigation and reclamation, and the Secretary of the Interior may make necessary regulations for the reservation of the lands applied for by the states to date from the date of the filing of the map and plan of irrigation, but such reservation shall be of no force whatever if such map and plan of irrigation shall not be approved. That any state contracting under this section is hereby authorized to make all necessary contracts to cause the said lands to be reclaimed, and to induce their settlement and cultivation in accordance with and subject to the provisions of this section; but

the states shall not be authorized to lease any of said lands or to use or dispose of the same in any way whatever, except to secure their reclamation, cultivation and settlement.

"As fast as any state may furnish satisfactory proof according to such rules and regulations as may be prescribed by the Secretary of the Interior, that any of said lands are irrigated, reclaimed and occupied by actual settlers, patents shall be issued to the state or its assigns for said lands so reclaimed and settled: Provided, that said states shall not sell or dispose of more than one hundred and sixty acres of said lands to any one person, and any surplus of money derived by any state from the sale of such lands in excess of the cost of their reclamation, shall be held as a trust fund for and be applied to the reclamation of other desert lands in such state. That to enable the Secretary of the Interior to examine any of the lands that may be selected under the provisions of this section, there is hereby appropriated out of any moneys in the treasury, not otherwise appropriated, one thousand dollars."

In the act making appropriations for sundry civil expenses of the government for the fiscal year ending June 30, 1897, and for other purposes, approved June 11, 1896, there is, under the head of appropriation for "surveying public lands," the following provisions:

"That under any law heretofore or hereafter enacted by any state, providing for the reclamation of arid lands, in pursuance and acceptance of the terms of the grant made in section four of an act entitled, 'An Act Making Appropriations for the Sundry Civil Expenses of the Government for the Fiscal Year Ending June Thirtieth, Eighteen Hundred and Ninety-five,' approved August eighteenth, eighteen hundred and ninety-four, a lien or liens is hereby authorized to be created by the state to which such lands are granted and by no other authority whatever, and when created shall be valid on and against the separate legal subdivisions of land reclaimed for the actual cost and necessary expenses of reclamation and reasonable interest thereon from the date of reclamation until disposed of to actual settlers; and when an ample supply of water is actually furnished in a substantial ditch or canal, or by artesian wells or reservoirs, to reclaim a particular tract or tracts of such lands, then patents shall issue for the same to such state without regard to settlement or cultivation: Provided, that in no event, in no contingency and under no circumstances shall the United States be in any manner directly or indirectly liable for any amount of any such lien or liability in whole or in part."

The limitation of time in the above quoted section 4 was modified by section 3 of the act entitled, "An Act Making Appropriations for Sundry Civil Expenses of the Government for the Fiscal Year Ending June thirtieth, Nineteen Hundred and Two, and for Other Purposes," approved March 3, 1901 (31 Stat., 1133-1188), which provides as follows:

Sec. 3.—That section 4 of the act of August eighteenth, eighteen hundred and ninety-four, entitled, "An Act Making Appropriations for Sundry Civil Expenses of the Government for the Fiscal Year Ending June Thirtieth, 1885, and for Other Purposes," is hereby amended so that the ten years' period in which any state shall cause the lands applied for under said act to be irrigated and reclaimed, as provided in said section as amended by the act of June eleventh, eighteen hundred and ninety-six, shall begin to run from the date of approval by the Secretary of the Interior of the state's application for the segregation of such lands; and if the state fails within the said ten years to cause the whole

or any part of the lands so segregated to be so irrigated and reclaimed, the Secretary of the Interior may, in his discretion, restore such lands to the public domain.

The conspicuous part in the foregoing act is the provision whereby lien is authorized to be created by the state to which such lands are granted, and when so created, shall be valid on and against the separate legal subdivisions of the land reclaimed, for the actual cost and necessary expenses of reclamation and reasonable interest thereon until disposed of to actual settlers; or, if an ample supply of water has been furnished by means of a canal, reservoir or artesian wells, for the reclamation of a particular tract of said land, then patent shall issue for the same to the state without regard to settlement or cultivation. This provision enables the state to offer the investor a substantial security for the money expended in irrigation works. Inasmuch as the benefits resulting from the construction of works of this class immediately accrue to the lands reclaimed, it is proposed that they stand pledged for the return of the capital thus invested.



Stacking Third Crop of Hay at Yuma.

The following letter sets forth the existing conditions pertaining to the several U. S. Federal Reclamation Projects:

DEPARTMENT OF THE INTERIOR.
UNITED STATES RECLAMATION SERVICE.

Office of the Director.

Washington, D. C., March 15, 1909.

Mr. Chas. R. Price,
711 Lankershim Bldg.,
Los Angeles, Cal.

Dear Sir:

Yours of November 1 and November 12, 1908, in regard to certain statistics of reclamation projects were duly received and I endeavored to make a prompt reply. At first I could not do so and give you the latest data as we were compiling the data up to December 31. Subsequently the pressure of work prevented my taking up the matter, for which I am very sorry.

I enclose copies of the Reclamation Record of November, 1908, and March, 1909, in which on pages 103 and 34 respectively, you will find the latest compiled data relating to the projects.

I send also a number of circulars descriptive of our projects, which are not quite up to date, and consequently there may be some slight discrepancies.

In the column "Cost per Acre, depending upon location," it is difficult to give accurate information, whether or not there is Government land available as in the case of most of our projects the public lands which were open to entry have been entered, and only an occasional opportunity exists for making new entries. It is possible, however, to purchase lands either by acquiring the rights of the present homestead entryman in connection with a relinquishment or by purchase after final proof has been made or patent issued.

In regard to the required length of residence on or near the land, in the case of homestead entries the conditions are the same on reclamation projects as elsewhere, except that the commutation provisions of the homestead laws do not apply. As to lands in private ownership, the matter of residence after a man has filed his water right application is largely subject to his own control as he may at any time pay the building charge in full and thus relieve himself of the requirement of residence.

The cost of water stock per acre is equivalent to what we call the building charge, which will be found in the table given in the record for March, for all projects where announcement has been made up to the present time. In addition to this building charge there is a charge for operation and maintenance which varies from 40 cents per acre to \$2.75 per acre, according to the specific conditions on each project.

The charge for operation and maintenance now in force for projects upon which public notice has issued is as follows:

Minidoka—60 cents per acre.
 Garden City—\$2.75 per acre.
 Sun River—50 cents per acre.
 Lower Yellowstone—\$1.00 per acre.
 North Platte—\$2.00 per acre.
 Truckee-Carson—60 cents per acre.
 Carlsbad—75 cents per acre.

Buford-Trenton—Fixed charge of 70 cents and an additional charge of 50 cents per acre-foot for water actually pumped and delivered for irrigation in any year.

Williston—Fixed charge of 70 cents and additional charge as above.

Umatilla—\$1.00 per acre.

Klamath—75 cents per acre.

Belle Fourche—40 cents per acre.

Okanogan—\$1.50 per acre.

Sunnyside—95 cents per acre.

Shoshone—\$1.00 per acre.

Huntley—60 cents per acre.

The following are the approximate times of completion for at least the first unit of each project:

| | | | |
|----------------------|---------------|-------------------------|---------------|
| Leasburg | 1908 | Shoshone | 1908 |
| Orland | About 1910 | Rio Grande | Several years |
| Grand Valley | Several years | Buford-Trenton | 1908 |
| Minidoka | About 1909 | Williston | 1908 |
| Payette-Boise | About 1910 | Lower Yellowstone | 1909 |
| Garden City | 1908 | Umatilla | 1908 |
| Huntley | 1909 | Klamath | 1909 |
| Fort Shaw | 1908 | Belle Fourche | 1908 |
| Milk River | Several years | Strawberry Valley | Several years |
| Truckee-Carson | 1907 | Okanogan | 1909 |
| Carlsbad | 1908 | Sunnyside | 1909 |
| Hondo | 1908 | Tieton | 1910 or 1911 |
| North Platte | 1908 | Wapato | Several years |

In addition to these projects we are ready or have been ready for delivering water from the following:

Salt River, Yuma, Uncompahgre.

Very respectfully,

MORRIS BIEN, Acting Director.

In the following table a list of the approved irrigation projects of the Reclamation Service with the area to be reclaimed, the estimated cost of construction, the estimated expenditures to December 31, 1908, and the corresponding per cent. of completion at that date:

| Location | Project | Area Acres | Estimated Cost Dollars | Estimates December 31, 1908 | |
|--------------------|----------------------------------|---------------|---------------------------|-----------------------------|---------------------------|
| | | | | Expenditure Dollars | Per cent of completion |
| Arizona | Salt River | 240,000 | 7,900,000 | ... | 61.6 |
| Arizona-California | Yuma | 92,150 | 5,630,000 | 2,875,000 | 51.1 |
| California | Klamath | 32,150 | 1,500,000 | 163,000 | 11.2 |
| California-Oregon | Oriand | 166,000 | 6,950,000 | 1,693,000 | 28.5 |
| Colorado | Grand Valley | 50,000 | 2,500,000 | 50,000 | 2 |
| Colorado | Uncompahgre | 146,000 | 5,500,000 | 3,515,000 | 64 |
| Idaho | Minidoka (Gravity) | 84,200 | 1,780,800 | 1,780,800 | 100 |
| Idaho | Minidoka (Pumping) | 49,900 | 600,000 | 211,000 | 35.2 |
| Idaho | Payette-Boise, So. Side Division | 132,000 | 4,765,000 | 2,250,000 | 47.2 |
| Kansas | Garden City | 10,656 | 355,000 | 355,000 | 100 |
| Montana | Lower Milk River* | 160,000 | 6,250,000 | 250,000 | 4 |
| Montana | Huntley | 33,000 | 840,000 | 340,000 | 100 |
| Montana | Sun River, Fort Shaw Unit | 16,000 | 480,000 | 480,000 | 100 |
| Nebraska | North Platte | 96,000 | 4,200,000 | 3,940,000 | 93.3 |
| Nebraska-Wyoming | Truckee-Carson | 100,000 | 4,390,000 | 3,951,000 | 90 |
| Nevada | Carlsbad | 20,000 | 640,000 | 640,000 | 100 |
| New Mexico | Hondo | 10,000 | 370,000 | 370,000 | 100 |
| New Mexico | Rio Grande | 160,000 | 8,000,000 | 65,000 | .8 |
| New Mexico | Leasburg Unit | 210,000 | 210,000 | 210,000 | 100 |
| New Mexico | Buford-Trenton | 316,000 | 316,000 | 316,000 | 100 |
| North Dakota | Nesson | 18,500 | 740,000 | 18,000 | 4.5 |
| North Dakota | Williston | 12,000 | 474,000 | 18,000 | 100 |
| North Dakota | Lower Yellowstone | 66,000 | 2,754,300 | 474,000 | 100 |
| No. Dakota-Montana | Umatilla | 20,440 | 1,208,400 | 2,570,000 | 82.5 |
| Oregon | Belle Fourche | 100,000 | 3,400,000 | 1,065,000 | 82 |
| South Dakota | Strawberry Valley | 60,000 | 2,880,000 | 2,000,000 | 56.8 |
| Utah | Okanogan | 9,000 | 585,000 | 630,000 | 21.9 |
| Washington | Sunnyside | 99,000 | 2,263,000 | 455,000 | 77.8 |
| Washington | Tieton | 30,000 | 1,800,000 | 881,000 | 39.1 |
| Washington | Wapato | 120,000 | 3,600,000 | 987,000 | 54.8 |
| Wyoming | Shoshone | 150,000 | 7,560,000 | 19,000 | 5.6 |
| | | 2,292,346 | 89,431,500 | 3,175,000 | 42 |
| | | | | 42,083,800 | .... |

*This does not include the St. Mary Project on which the estimated expenditure is \$257,000.
 †The Leasburg diversion dam will furnish a temporary, intermittent supply to about 20,000 acres, which will be a portion of the Rio Grande Project and share in the benefits of the Engle Dam.
 From Reclamation Record for November, 1908.

| State | Project | Date of public notice | U. S. farm units, number | Irrigable areas, acres | | | | | U. S. re-serves acres | Total water right building charges per acre | U. S. farm units entered on Sept. 30, 1908 | | Water-right applications for private land to Sept. 30, 1908, acres |
|---------------------------------------|---------------------------|-----------------------|--------------------------|------------------------|-----------|----------|----------|-----------|-----------------------|---|--|------------|--|
| | | | | Public | Private | State | Railroad | Total | | | No. | Acres | |
| | | | | | | | | | | | | | |
| Arizona | Salt River | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Arizona-California | Colorado River | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Arizona-California | Yuma | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| California | Orland Valley | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Colorado | Uncompahgre Valley | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Colorado | Minidoka, gravity system | June 30, 1908† | 1,207 | 79,932.31 | 286.90 | 1,866.47 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Idaho | Minidoka, pumping system | Mar. 7, 1908† | ..... | ..... | ..... | ..... | ..... | 82,065.68 | ..... | \$22.00 | 1,031 | 69,820.91 | ..... |
| Idaho | Payette-Boise | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Idaho | Garden City | ..... | ..... | ..... | 10,677 | ..... | ..... | 10,677 | ..... | 35.00 | ..... | ..... | 5,228 |
| Kansas | Lower Milk River | Mar. 6, 1908 | 584 | 26,679.34 | 3,108.86 | ..... | ..... | 28,758.20 | 2,563.51 | 30.00 | 204 | 11,770† | ..... |
| Montana | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Montana | St. Mary | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Montana | Sun River, Fort Shaw Unit | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Montana | Lower Yellowstone | Mar. 23, 1908 | 206 | 12,433.36 | 1,950.38 | 377.34 | ..... | 14,761.08 | 374.7 | 30.00 | 36 | 2,020† | ..... |
| Montana-No. Dakota | North Platte | Dec. 21, 1908 | 180 | 8,157.44 | 29,623 | 1,815 | 3,957.41 | 43,552.85 | 331 | 42.50 | ..... | ..... | ..... |
| Nebraska | Truckee-Carson, 1st unit | July 29, 1907 | 387 | 29,357 | 5,710.10 | 2,334 | ..... | 37,401.10 | 2,006.28 | 35.00† | 180 | 14,426.53 | 1,576.5 |
| Nevada | Truckee-Carson, 2nd unit | May 6, 1907 | 410 | 28,542.10 | 15,941.99 | ..... | 8,469 | 54,490.09 | 1,805.4 | 30.00 | ..... | ..... | ..... |
| New Mexico | Carlsbad | Apr. 4, 1908 | 210 | 14,074 | 12,770 | ..... | 1,537 | 26,844 | 2,990 | 30.00 | 323 | 26,060.88† | 4,632.27† |
| New Mexico | Hondo | Dec. 17, 1907 | ..... | ..... | 20,073 | ..... | ..... | 20,073 | ..... | 31.00 | ..... | ..... | ..... |
| New Mexico | Leasburg | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| New Mexico-Texas | Rio Grande | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| North Dakota | Buford-Trenton | Apr. 8, 1908 | 11 | 460.41 | 3,498.28 | 90.95 | ..... | 4,049.64 | 463.03 | 38.00 | 2 | 94 | 1,618.68 |
| North Dakota | Washburn | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| North Dakota | Williston | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| No. Dakota-S. Dakota | Bowman | Apr. 27, 1908 | 4 | 112 | 7,737.31 | 198 | ..... | 8,047.31 | 272.4 | 38.00 | ..... | ..... | 3,896.64 |
| Oklahoma | Cimarron | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Oregon | Central Oregon | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Oregon | Umatilla, first unit | Dec. 27 1907 | 300 | 3,876.5 | 2,938.5 | ..... | ..... | 6,814 | 240 | 60.00 | ..... | 462 | 3,666.26 |
| Oregon | Umatilla, second unit | Nov. 12 1908 | 129 | 1,542 | 877 | ..... | ..... | 2,419 | 60.00 | ..... | ..... | ..... | ..... |
| Oregon-California | Klamath | Nov. 18, 1908 | 4 | 67 | 30,763 | ..... | ..... | 30,830 | 30.00 | ..... | ..... | ..... | ..... |
| South Dakota | Belle Fourche | June 21, 1907 | 67 | 3,736.73 | 8,286.30 | ..... | ..... | 12,023.03 | 30.00 | 13 | 1,099 | 4,398.13 | ..... |
| Utah | Strawberry Valley | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Washington | Kranogan | Nov. 12 1908 | 8 | 200 | 1,922 | ..... | ..... | 2,122 | 160 | 65.00 | ..... | ..... | ..... |
| Washington | Sunnyside | Nov. 18, 1908 | 30 | 1,085 | 5,320 | ..... | ..... | 6,405 | 52.00 | ..... | ..... | ..... | ..... |
| Washington | Tieton | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Washington | Wapato | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Washington | Shoshone | ..... | 272 | 15,052.99 | ..... | 183.79 | ..... | 15,236.78 | 640 | 45.00 | 132 | 7,470† | ..... |
| Wyoming | ..... | Nov. 25, 1907 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Approximate totals, December 31, 1908 | | | 3,959 | 123,307 | 161,484 | 6,866 | 13,963 | 406,620 | 111,796 | ..... | ..... | ..... | ..... |

†Preliminary plats issued for conforming entries to farm units.

†Brought up to December 31, 1908.

*By public notice issued since this table was printed the charge for new water right application is increased to \$45.

The State Engineer

and His Relation to Irrigation.

Under the above caption the U. S. Department of Agriculture has published a pamphlet (Office of Experiment Stations—Bulletin No. 168), which points out the varied practices pursued by the different states. This makes clear the fact that there are many objections to the present policies of the several different states, which, while they differ widely in their conceptions of the manner in which the matters surrounding the distribution of that utility which is most important within the semi-arid land sections and without which lands of potential fertility must lie barren, should be handled; all seem at variance with the equitable solution of this important question.

This bulletin makes no distinct recommendation, but when one who is familiar with irrigation practices, not only of our own but of other countries, compares the conditions, he sees clearly that the lack of uniformity of the water laws of the several states cannot but result in chaos.

It may seem presumptive for one to criticize the acts of those representatives of the people; who in their wisdom, perhaps after full and exhaustive study of the conditions surrounding the question of irrigation and the use of public waters, formulated these laws, yet the writer is going to assume the responsibility for indulging this criticism.

It is his belief that the whole theory of the several laws is founded upon a wrong conception and that this error rests in the fact that the control of the waters should be vested, not in the hands of appointed or of elected officials of states, nor even of the states themselves, but that the public waters should be treated as being all that the name suggests and regarded as something for Federal control.

It is not equitable that a river which runs beyond the boundaries of a state should have its waters affected to the detriment of other states through which it flows, unless in so doing its diversion does the greatest good to the greatest number. And under the same argument it is palpably unfair that the waters of such a river may be wantonly wasted by the people having water rights under the laws of the state which is located higher upon the stream's flow to the great injury of those who are lower down and to whose lands the water, be it not wasted, must bring fecundity or the crops will never ripen.

The way in which the average water appropriator looks at his rights is illustrated by Elwood Mead, a Federal expert, who says: "In talking of this an intelligent, fair-minded ditch owner last year voiced the prevailing opinion in the following words: 'I filed on this water, and it is mine to do with as I please. I can run it into a gopher hole if I want to. I can sell it, or rent it to my neighbors, or I can waste it in the sand, and neither the Government nor State has any right to object.' "

If it were true that each of the rivers of our country, from their sources to their mouths, lay within the boundaries of any certain ones of these States, then it would be more equitable for such a state to frame its own laws for the control of the waters of such rivers. It is, however, the fact that most of these rivers are interstate streams—vast systems whose water sheds and network of

channels embrace a territory of many thousand square miles and include many states—and it seems most unfair that the waterflow of such an interstate stream be subject to the will of any one state because, for a part of its course, the flow chances to be within that state's boundaries.

In the semi-arid land states where the deep, sandy, alluvial soils are not adapted to "dry-farming," irrigation is necessary and water is a utility as important to the growth of vegetation as is sunlight. It would be as inequitable for a state to attempt to control the winds which blow across its area (if such a thing were possible) as to assume proprietorship of a stream because a portion of its flow chances to be within that state.

But that is not the worst of our practice. The state does not retain control. It grants water rights at random to individuals or associations who are a law unto themselves and they are permitted to segregate the water rights, and if they so choose, to do with it as they will, "and neither the Government nor the State has any right to object."

In some portions of Spain this same practice was followed and today we can see the result of it. In the district of Elche the water rights were separated from the lands and gradually outsiders obtained these water rights. Now the farmer buys water from these owners of streams just as he buys fertilizers. The water tolls have been raised, farmers impoverished, and all progress and prosperity banished. That is what the future holds for us if our water laws are not changed so that this may be prevented.

The solution lies in the Federal control of public waters, of interstate streams, and, in the interest of all the people in all of the lakes and streams. Other countries have anticipated this and their laws are framed with this end in view.

In Canada the water is the property of the Crown and permits to use it are granted to individuals. In Mexico the land and water are inseparable and the owner of lands has the right to use the waters tributary to the land for irrigation, and this right is always subject to Government control. In the province of Valencia, Spain, the same rule is followed and there the people are prosperous and happy. In the province of New South Wales, Australia, the riparian and water rights were abrogated after careful consideration and investigation as to the practices in foreign lands and the crown was declared the owner of the waters of all rivers and lakes.

All of these laws are along the right lines and ours are just the opposite. An improper conception of the importance of the question has led our states to make most wonderful errors, which would be vastly amusing and humorous, were they not so serious.

In California the doctrine of appropriation and the common law doctrine of riparian rights are both part of the state's irrigation laws. They are directly antagonistic and cannot be reconciled. The riparian right exists by virtue of a statute and in brief provides that the flow of a stream must not be impaired or diminished. The doctrine of appropriation is upheld by court decisions and gives to individuals the right to take the waters from the stream. The humor of the situation appears in the fact that under the law appropriators claim over 100,000,000 inches of the waters of the San Joaquin and Sacramento valleys, which is far more water than the flow of the combined waters of these streams; and, under the law, have the right to take that water from the streams, and at the same time the riparian owners have well defined rights

which provide that none of the water may be taken from the streams and that those same streams must be permitted to flow past their lands undiminished in quantity!!! "There are three consecutive claims to all of the water in the San Joaquin River, and the aggregate of all claims in California represents enough water to submerge the continent." (Elwood Mead.)

No one, whether he be a holder of a water right or a riparian owner knows with any certainty to how much water he is entitled, nor how soon he may be thrown into expensive and lengthy litigation. The laws are so conflicting and so opposed to equity that the fancied rights are worthless as they now stand and it is in the interests of all that these rights be defined. The conflicting claims of today mean nothing and have no real value. The holder of a water right within a state has nothing of real value, if other rights in other states higher up the river have granted title to the river's flow. It is entirely within the range of possibility for the holders of these higher rights to divert the entire flow and to sell the water to users within their own and lower states "as they would fertilizers," and to effect the delivery through long aqueducts or canals constructed for that purpose.

This is not probable, but it is not impossible. There are many impositions which might be practiced which with a little thought become apparent to the most casual of readers.

Our water laws are bad—very bad—and their solution lies in Federal control. Washington should frame laws based upon the theory that the water is an integral part of the land and the right to use water for irrigation should go with the irrigable lands forever. The laws should contemplate that this right to use the water should be granted to the land holders as permits or licenses, and such concession should be given by Federal officers. There should be no charge for the use of water under any theory or conception.

Provision should be made under our laws as it is under the laws of Mexico that when any individuals or quasi-public corporations so desire they may provide large canal systems through which waters might be conveyed to alluvial soils, but that such systems must have their being under and be subservient to Federal authority. These systems should gain their income from payments made pro rata by the land owners for the maintenance and operation of the system upon a basis fixed by the Government as is the practice in Mexico, whose laws are models of equity.

The conditions obtaining in our several semi-arid land states are briefly referred to in the following paragraphs which are quoted from the bulletin to which reference is made at the beginning of this chapter.

The office of State engineer is peculiar to the arid States, and the duties of the office have to do chiefly with irrigation. These duties range from merely making hydrographic surveys, as in Oregon, to practically complete control of the water supply, as in Nevada. It is true, however, that in most of the arid States whatever there is of public control of the use of water centers in the office of State engineer. A comparative study of the work of the engineers involves, therefore, the whole subject of public control of water.

The final purpose of the creation of the office of State engineer is the delivery of the water to which he is entitled to each farmer whose farm is under irrigation, and a necessary preliminary to this is a knowledge of how much each is entitled to. The early laws governing irrigation were not such as to provide a record of rights, and it is therefore necessary to provide means for defining existing rights. This in some States has been committed to the engineer, in others he makes surveys to assist the courts in this work, while in others he has nothing to do with it. To avoid future trouble, it is also neces-

sary that hereafter rights be defined as they are acquired, and several States have provided that rights be acquired under the supervision of the engineer, while others still have no provision for supervising the acquirement of rights, but leave the defining of the rights to be done when controversy regarding them arises. The final act—the distribution of the water of streams to those entitled to it—is in some States all that devolves upon the engineer, while in some States the engineer has not this duty, but has a part in the proper defining of rights.

It is the purpose of this report to describe the methods used in the different States for accomplishing the three acts—defining existing rights, supervising the acquirement of new rights, and distributing water—and in exercising whatever additional control over irrigation exists, in the hope that this comparative study may bring out the strong and weak points in the different systems and help toward the adoption of the best methods in all the States.

In this report the States which have now or have had engineers are taken up in the order in which the office was created.

CALIFORNIA.

California was the first State to create the office of State engineer. A long series of discussions and proposals for different systems of public control of irrigation in California, which included National control and construction, State control and construction, and various other schemes, culminated in 1878 in the passage of a law creating the office of State engineer for the purpose of collecting information as to water resources and irrigable lands. The purpose of the law was "the acquirement of data upon which the State might formulate a policy and frame legislation respecting irrigation matters."* The office was continued for ten years, during which time there was much criticism on account of the lack of results, and in 1887 the legislature made an appropriation for salary and expenses for one year, with the proviso that this should be in full for the completion of all work then in the hands of the State engineer. Two large reports were issued, one on irrigation in Italy, Spain, and France, and one on San Diego, San Bernardino, and Los Angeles counties, Cal. Since the abolition of the office there has been more or less agitation for its revival, but in general the people of California seem to be quite indifferent on this matter.

Rights are acquired without public supervision and are defined only in case of controversy, and water is divided without any public supervision, the only remedy when one's rights are infringed being a suit to define rights if they have not been defined, and a proceeding for contempt of court if any party is taking water which has been allotted to another by the court.

COLORADO.

The office of State engineer was created in 1881, the engineer being given general charge of the distribution of water throughout the State. The same law provided for the defining of existing rights by the courts, and for filing claims for new rights with the county clerks and the State engineer, the idea being that this filing of claims would provide a record of new rights. The provision for filing claims was, however, declared void on account of a defect in the title of the act. In this plan the engineer is considered a purely administrative officer, and his duties, so far as they relate to irrigation, were confined to general supervision of distributing water after rights have been defined.

WYOMING.

The office of Territorial engineer was created in Wyoming in 1886. Prior to that there was provision for water commissioners who were to distribute water, but no other provision for any public control of water. The Territorial engineer was given general supervision of the diversion and division of water and supervision of the work of the water commissioners. He was also to make measurements and calculations of stream flow and collect facts as to systems of reservoirs. The clerks of courts were instructed to send copies of all decrees to the engineer, who prepared from them instructions to the water commissioners.

The present system was created when Wyoming was admitted as a State, in 1890, the outlines being embodied in the constitution and the details supplied

*Wm. Ham. Hall's Rpt., Pt. 1, p. 12.

by the first legislature. The system as adopted at that time and still in existence, with only minor changes, contained two radical departures from existing practice in this country. These were the adjudication of rights by an administrative body, and the acquirement of rights through application to a public official, who had power to refuse it under certain circumstances, rather than by taking the water and posting and filing a claim as notice to others of the existence of the right. These provisions were founded on a principle new to American irrigation law. The State was declared to be the owner of the water and rights to its use were to be acquired by grant or license from the State, while under the old system the water was considered as belonging to the public, and the State exercised only such supervision as was necessary to preserve the peace. This new interpretation has been denied by the supreme court of the State, although it has upheld the laws as a proper exercise of the police power of the State (*Farm Investment Company v. Carpenter*, 61 Pac., 258; *Willey v. Decker*, 73 Pac., 210), but the principle in mind when the laws were enacted was undoubtedly that the State was proprietor of the water and granted rights to its use.

The new code adopted on the admission of the State provided for the adjudication of all existing rights, the acquirement of rights in the future, and the distribution of water to those entitled to its use.

NEBRASKA.

In 1895 Nebraska adopted a system of water administration similar in outline to the Wyoming system, but differing considerably in detail. It provided for the administrative defining of existing rights, for the acquirement of rights under State supervision, and for the distribution of water by State officials.

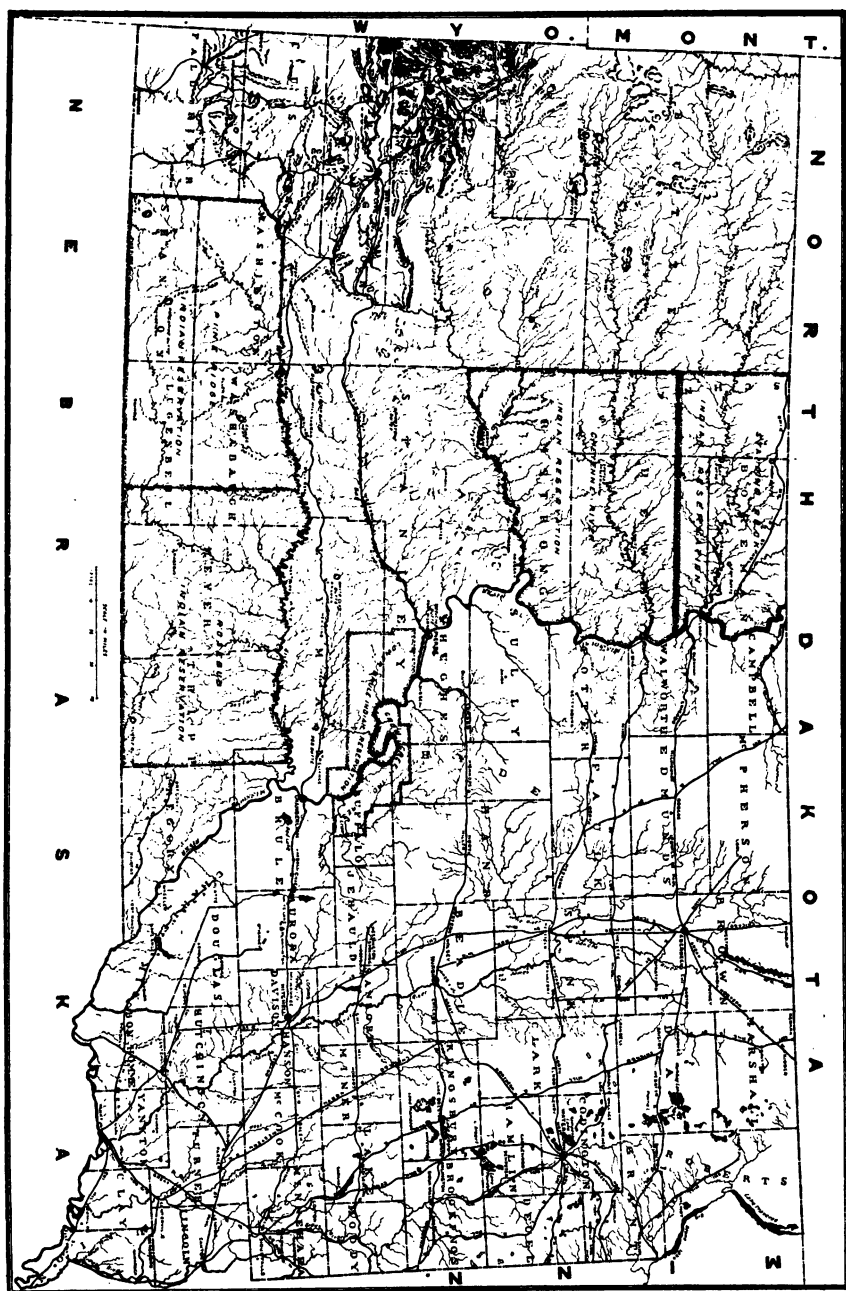
The State board of irrigation is at the head of this system, but this differs from the Wyoming board of control in that it is composed of State officials having other duties instead of officials having to do only with the administration of water laws. The board is composed of the governor, the attorney-general, and the commissioner of public lands, the governor being president. The board elects a secretary, who must be a hydraulic engineer, and is commonly called the State engineer. The secretary, with the consent of the board, employs an assistant, who must be an engineer.

It is made the first duty of the secretary to measure or cause to be measured the flow of the streams of the State and to make additional measurements from time to time for the information of the board in considering applications to appropriate water and controversies that arise in the distribution of water.

Prior to the passage of the law of 1895 there was no provision for defining water rights except as controversies arose, and until 1889 no prescribed procedure for acquiring rights. In fact, it was not settled whether rights could be acquired by appropriation or whether riparian owners alone could use the water of the streams of the State. In 1889 a law was passed providing for the acquirement of rights by the prevailing method of posting and filing notices, building works, and using water. It has since been held that the passage of this law abrogated the riparian rights of lands still belonging to the General Government, and that prior to 1889 rights to water were acquired both by the acquirement of riparian lands and by appropriation, and in case of conflict priority of acquirement was to govern. (*Crawford v. Hathaway*, 93 NW., 791.)

IDAHO.

The office of State engineer was created in 1895, in connection with the acceptance of the conditions of the Carey Act. The engineer is required to examine plans submitted under that act to determine whether they are feasible and beneficial to the public; whether there is unappropriated water in the source of supply; whether he has approved a permit for the appropriation of the water to be used; whether the works planned are of sufficient capacity to properly supply the land; whether the cost of construction is reasonable; whether the maps filed comply with the regulations of the Department of the Interior and with the regulations of the State engineer's office, and whether the lands applied for are desert in character. If necessary, in order to determine any of these things, the engineer may make surveys. He reports his findings to the State land board, which has the approval of plans under the Carey Act. The construction of works under this law is also subject to



Map of South Dakota, Showing Streams Available for Irrigation.

inspection by the State engineer. He is required to measure the flow of streams, locate and survey reservoir sites, and give estimates of capacity and cost. All parties wishing to build dams over 10 feet high are required to have their plans approved by the engineer, and he is also required to inspect existing dams over 20 feet high.

Since 1901 irrigation district plans also have been subject to the approval of the State engineer. The maps, estimates, and descriptions of proposed districts are submitted to the engineer sixty days before the hearings on the organization of the districts before the county commissioners. The engineer examines the plans and in some cases goes over the ground and reports to the county commissioners. If the engineer reports adversely, the matter is dropped, except that the petitioners may amend their plans in such a way as to meet the approval of the engineer. Idaho has gone further than any other State in aid of irrigation districts, paying benefits assessed on State lands included within the boundaries of such districts, and on the other hand, it is the only State requiring that district plans be approved by any State official.

Up to 1903 the engineer had nothing to do with the acquirement of rights or the distribution of water, his duties being chiefly making general surveys of the water resources of the State and in connection with the Carey Act projects and irrigation districts. In that year an attempt was made to provide by law a complete system of public control of the water supply of the State with the State engineer at the head.

UTAH.

In the early history of the Territory of Utah there was a considerable degree of public control of the use of water for irrigation, but there came a period of indifference to this, due probably to the settlement of controversies by the church authorities. This had become so marked at the time Utah became a State (1896) that efforts to secure thorough State control of irrigation resulted only in the recognition of existing rights to water. The next year the office of State engineer was created, but he was given no control of the water supply. He was to examine and report on reservoir sites for the State board of land commissioners, submit plans and estimates for reservoirs, supervise the construction of reservoirs by the State, and examine and pass upon all other irrigation work in which the State had an interest. He was also to keep a record of stream gaugings, and inspect all dams over 10 feet high, and require repairs on those considered unsafe. However, there was in this no element of State control.

In 1901 the duties of the engineer were considerably enlarged, and the authority of the State to regulate the use of water was recognized. Provision was made for the distribution of water by commissioners appointed by the county commissioners, and the State engineer was given supervision over these and required to instruct them in the measurement of water. With a few exceptions the boards of county commissioners failed to appoint water commissioners, and this part of the law was inoperative. The making of surveys and maps of streams and irrigated lands was also added to his duties.

In 1903 a complete system of public control was adopted. The water of the State was declared to be the property of the public, subject to existing rights, and the State engineer was given "general supervision of the waters of the State and of their measurement, apportionment, and appropriation." The law provides in detail for the defining of existing rights, the acquirement of new rights, and the distribution of water by public officials.

NEVADA.

The office of State engineer in Nevada was created in 1903. In 1901 there was created a State board of irrigation, composed of the governor, the surveyor-general, and the attorney-general. In 1905 the State engineer was made a member of this board also. The first duty assigned to the State engineer was to define existing rights to water in the State of Nevada. To provide a basis for this defining of rights, all county recorders were required to furnish the engineer with copies of the claims to water rights filed in their respective counties. In 1889 a law was passed requiring all parties having claims to water from the streams of the State to file their claims with the county

recorders. This law was repealed four years later; but before this repeal the owners of most of the existing rights had filed claims with the county recorders, and most of those who have acquired rights since that time have done so. Since the passage of the new law all but three counties in the State have supplied the engineer with copies of the claims. These claims furnish the engineer with a basis for beginning his adjudications.

MONTANA.

While Montana has a State engineer, he has nothing to do with the control of the water supply of the State. The office was created in 1903 in connection with the acceptance of the Carey Act. The State has a Carey land act board, composed of the State engineer, the secretary of state, and the State examiner, the State engineer being chairman. His duties are to examine State lands to determine their irrigability, examine and measure the streams of the State, and serve on the State board of health. In addition to the above, all applications to the Carey land act board to reclaim land under that law are submitted to the State engineer, and he is required to examine the land applied for and determine the feasibility of its reclamation. If he approves the project, he is to cause the reservation to be made and notify the applicants of his action in the matter. The law further provides that anyone wishing a reconnaissance for a proposed Carey Act project may apply to the board, depositing the money to cover the expense, and have the examination made by the State engineer. It is further provided that parties wishing to reclaim land under the Carey Act may organize cooperative associations for the purpose of reclaiming by their own labor lands subject to reservation. For such associations the State engineer is required to investigate the proposed project, and if he finds it feasible he is to prepare the maps and data required for having the land segregated under the Carey Act and prepare the engineering plans necessary for the reclamation of the land and exercise general supervision over the carrying out of the plans. No applications for work under this provision have been made.

The Carey land act board succeeded the arid land grant commission, which was created by the original law accepting the conditions of the Carey Act. The commission has entered into contracts for the reclamation and settlement of three tracts. Work under all these was incomplete at the time of the creation of the new board, and the first work of the engineer was to examine into the condition of these three projects. One of them, at Billings, has been completed, examined by the engineer, and approved by him. The other two have been examined by him and found in very unsatisfactory condition. The board is attempting to straighten out their affairs so that work can proceed and the projects be carried out.

Aside from the examination of these three Carey Act projects, the work of the engineer's office has been confined almost exclusively to examining State lands to determine their irrigability. In some instances the work has included the making of plans for works to reclaim the lands, but at present there is no authority to reclaim any land. The plans are being made in the hope that the State will be able by showing the feasibility of plans to induce some one to take up construction of the works to reclaim the lands.

NORTH DAKOTA.

In 1905 North Dakota adopted a code of water laws providing for the adjudication of existing rights and the complete public control of the water supply in the future. The office of State engineer is created, and the engineer is given "general supervision of the waters of the State and of the measurement and appropriation thereof."

The previous law of North Dakota provided for posting and filing notices, as did the laws of other States, and the State engineer has secured from the county officers copies of all such notices. The records show nothing as to what was done under these notices, but the engineer has examined the locations covered by a number of them and found that nothing had been done under those particular ones. The early notices seem, therefore, to represent very few, if any, existing rights. This is shown also by the census of 1902, which gave the area irrigated in North Dakota as about 10,000 acres. This includes considerable areas which are flooded by natural overflow. The area which can be

called irrigated is much smaller. The present law, therefore, goes into effect with very few undefined rights to stand in the way of the engineer in assuming control of the waters of the State. The engineer is empowered to make all necessary general rules and regulations to carry into effect the duties devolving upon his office.

SOUTH DAKOTA.

The office of State engineer of irrigation was created in South Dakota in 1890. The duties of the office were to make general investigations of the artesian supply in the State and confer with manufacturers of well-drilling machinery and transportation companies, with a view to securing such machinery at the least possible cost. A later law provided for the location of artesian wells by the engineer on application of the residents of any township and for inspection of the completed wells by the engineer. The office was abolished in 1897 and provision made for an instructor in the State agricultural college, who should perform the duties of the engineer without expense to the State.

The matter stood in this way until 1905, when a general law was passed creating the office of State engineer and providing for the adjudication of existing rights, acquisitions of new rights according to the Wyoming system, and for the distribution of water by State officials. Water from all sources not navigable is declared to be the property of the public and subject to appropriation for beneficial use. The engineer is to be appointed by the governor and confirmed by the senate, to hold office for six years and receive a salary of \$2,000 per year. "He is to have the general supervision of the waters of the State and of the measurements and appropriation thereof, including the duties of locating surveys and making estimates of the cost of drainage canals and ditches within the State to carry off the surplus waters caused by the overflow of rivers, or otherwise preventing malarial diseases and damage to growing crops." However, no appropriation was made for the carrying out of the provisions of the law, and it has therefore been inoperative.

OREGON.

The office of the State engineer was created in 1905, but he was given little control of the waters of the State, his duties being confined almost entirely to making hydrographic and topographic surveys in the State. There was appropriated \$2,500 for hydrographic surveys and \$2,500 for topographic surveys, both contingent upon the setting apart of equal sums for similar work by the General Government. The United States Geological Survey has supplied these funds, and the State engineer is the resident hydrographer of the Survey. Gaugings of the various streams of the State and topographic surveys of the irrigable lands are being made under this provision.

Whenever any suit for the determination of water rights is brought and the State is a party to the suit, the court may call on the State engineer to make surveys similar to those referred to above. These surveys are to include complete hydrographic surveys of the entire stream system to determine the amount of water used by each claimant, the character of the land watered, and the duty of water for each tract, and the collection of all data necessary for the adjudication of the rights involved.

Such a suit has been begun on the Walla Walla River at Pendleton. No provision is made by law for paying expenses of the surveys to be made by the State engineer, his interpretation of the law being that the \$2,500 appropriated for hydrographic surveys can not be used for this purpose, but must be devoted to general hydrographic surveys. The cost of surveys made in connection with suits is to be taxed against the parties, but the parties in the Walla Walla suit have made up a fund to pay for the surveys. The engineer has established stations to obtain complete records of stream and canal flow, is surveying and mapping all the ditches and irrigated lands, showing on his maps the character of the soil and character of the crops. He is required to make an estimate of the duty of water for each tract, and the surveys will contain the information on which he must base his estimates of duty. The law requires that the engineer shall "gather all data necessary for the adjudication of all rights involved." This he has interpreted to mean simply the information which can be secured by the making of surveys, but does not include any taking of testimony as to dates of construction of works and the use of water.

The suit on the Walla Walla just referred to is the only one which has been brought to which the State has been made a party. It will be noticed that this provision for surveys by the engineer applies only to actions to which the State is a party. In the Walla Walla case the State is made a party on the following grounds:

That the State of Oregon owns lands on the tributaries of the Walla Walla River, holds mortgages on lands situated upon said river, and claims and asserts an interest in all surplus waters of said stream, and the right to control the same, during seasons of the year when there may be a surplus in said stream, which right is asserted under and by virtue of an act of the legislative assembly of the State of Oregon, approved and filed in the office of the secretary of state February 22, 1905, and for that reason is made a defendant herein.

There is no provision for the beginning of an adjudication by the State on its own motion.

OKLAHOMA.

Oklahoma in 1905 adopted a code of water laws similar to those of North and South Dakota. This provides for the bringing of suits for the determination of water rights by the attorney-general of the Territory after hydrographic surveys have been made by the Territorial engineer, for the intervention of the Territory in suits brought by private parties to determine water rights, and for the making of hydrographic surveys by the Territorial engineer upon the order of any court which is adjudicating water rights.

Rights are to be acquired by application to the Territorial engineer, who has authority to refuse them upon the ground of hostility to the public interests or an insufficient supply.

The water is to be distributed under the supervision of the Territorial engineer by commissioners appointed by the governor. The law makes no provision for the appointment of a Territorial engineer at the present time, but provides that until such appointment is made the secretary of the Board of agriculture shall do the work of the engineer.

NEW MEXICO.

The office of Territorial engineer was created in New Mexico in 1905, but, as in South Dakota, no appropriations were made for salary and expenses, and the law has not been put into effect. It provides merely for the adjudication of existing rights, and follows the Wyoming system exactly. The board of control is composed of the Territorial engineer and six water commissioners. The Territory is divided into six divisions, for each of which there is one commissioner. When a stream is to be adjudicated the commissioner for the district in which it is located collects the testimony as to dates of appropriation, etc. The Territorial engineer makes surveys; the testimony is open to inspection; protests are allowed and heard, and all the evidence collected, and the maps made are submitted to the board at the next meeting, when the rights are defined by the board and certificates issued. This law provides that all the natural waters within the limits of New Mexico belong to the public and no person shall be denied the right to appropriate said waters for beneficial use. This is similar to the provision of the Colorado constitution, which has been held by many to prohibit the State from prescribing the manner of making such appropriations and from giving the engineer or any other official authority to reject any application for permission to appropriate water on the ground of there being no unappropriated water in the source of supply or for any other reason. This point has never been squarely decided by the Colorado supreme court, but the opinion above cited is very generally accepted in Colorado. If this view is correct, rights must be acquired without public supervision until this provision of the law is repealed.

Parties wishing to construct dams must submit plans to the Territorial engineer. For large works he may require excavations to determine the character of the foundations and may visit the location of such works before giving his approval, and no rights may be acquired if such works are built without the approval of the engineer. He has authority to inspect any dam within the Territory of New Mexico, and if he finds it in an unsafe condition he may order such repairs as he deems necessary. If the owner refuses to make the repairs

ordered, the engineer reports the case to the judge of the district court, who may order the sheriff to draw off the water from the dam and keep it drawn off until the repairs are made.

GENERAL DISCUSSION.

As was stated in the introduction to this report, the primary purpose of the creation of the office of State engineer in irrigated States is the distribution of the water to those entitled to its use. The engineers in the various States have other duties, but these are incidental. A first requisite for this distribution is well-defined rights. Without this the engineer has no basis on which to distribute water. Notwithstanding this, the great body of rights in the United States were acquired without such supervision as would definitely limit and define them. Because of this fact the first step in providing for the distribution of water has been the provision of a method for defining existing rights. The second step is a provision for the acquirement of rights under such public supervision as will insure a complete list of those rights. The essential things are that the list must be complete and that the rights must be accurately defined. In so far as they fall short of this the basis for distribution is faulty. The laws of the various States providing for the defining and acquiring of rights must be judged by this standard—do they provide for a complete and accurate list of all rights to water?

The first laws looking to the provision of a list of rights were those regarding the filing of copies of notices of claims with the county officials. Such laws have been in existence in practically all of the States. These have notoriously failed of their purpose, for the reason that there was no limitation on what could be claimed and no record of what was done by the claimant after the claim was filed. It has always been a fundamental principle of irrigation law that a right to water could be acquired only by diverting and using the water. A record of claims, therefore, has no value as a record of rights. Up to the present time no other provision for securing a record of rights as they are acquired has been made in California, Montana, and Washington, except that in Montana a person having completed irrigation works may file with the county a map and statement showing what has been done.

A second step was a provision for the filing of claims with the State engineer, as well as with the county officials, the purpose being to have in one place a complete record of all claims within the State. This provision has also failed. This is the present system in Colorado and Oregon. Under these laws there was no provision for determining what rights had been acquired, the rights remaining undefined until they were brought before the courts in suits between rival claimants to the same source. In such suits only the rights of the parties to the suits would be defined, the complete defining of the rights of all parties on a single stream under this system requiring an infinite number of suits. To prevent this most of the States have since adopted a provision that in any suit regarding water rights all persons claiming rights to water from the same source may be made parties to the action. Colorado has gone further and provided a special procedure to be followed by the courts for defining rights. This system avoids the multiplicity of suits, but it makes no provision for a complete list of rights, as no adjudication will take place until conflict has arisen. While this is a serious defect this system has been criticised more severely on the ground of inaccuracy in defining rights. This has been especially true of the operation of the law in Colorado. In that State there is no provision for expert advice as to capacity of ditches, which is usually determined from the testimony of the interested parties. This has resulted in decrees confirming to claimants rights to many times as much water as they had ever used or their ditches would carry, and these decrees have been the source of some of the most serious difficulties which have arisen in irrigated districts in Colorado.

As a direct result of the inaccuracy of this Colorado system of defining rights, Wyoming adopted its system under which rights are determined very largely by administrative officers on data secured by surveys and measurements made by experts, and rights are limited not by the capacities of the works, but by the needs of the lands watered. In this way greater accuracy has been

secured, but from the standpoint of the officer charged with the distribution of water the greater advantage of the Wyoming system is that under it it is possible to secure a complete list of all existing rights. The board of control which defines rights is not compelled to wait until conflicts have arisen, but as soon as its means will permit may make the measurements and collect the data for determining the rights on any stream and make its order defining them. If funds had been provided it would have been possible within a very few years, under the Wyoming law, to define all the rights within the State, but funds have been limited, and after sixteen years there are still many undefined rights in Wyoming. This system has been copied with slight modifications in Nebraska, Nevada, and New Mexico. In Nebraska and Nevada the process was simplified by leaving to the board of irrigation the procedure under which rights are defined. In both these States it has been left to one man, the State engineer, to make the surveys, collect the testimony, and define the rights, reserving, in Nebraska, the right of appeal to the State board and later to the courts, and in Nevada to the courts. In Nebraska this resulted in the complete defining of existing rights within a very few years. The Nevada law has been in effect but three years, but the determination of rights there is much more rapid than in Wyoming.

In the other States it is very generally held that the determination of rights is a judicial matter, and can not therefore be delegated to an administrative officer. In those States there has been an attempt to secure the advantages of the Wyoming system and still leave the matter in the courts, provision being made for surveys by the State engineer whenever suits regarding water rights are begun. This provision has been adopted in Idaho, where, however, it is discretionary with the court whether the engineer will be called in, and in Utah, Oregon, North and South Dakota, and Oklahoma. But these laws are of so recent date that their efficiency has not been tested. For the sake of providing a complete list of rights where their defining is left in the courts, the State engineer or some subordinate has been authorized to begin actions after making such surveys and measurements as are necessary. This provision has been adopted in Idaho, Utah, North and South Dakota, and Oklahoma. The only State where this system has been tested is Idaho, where it was declared void, because the official authorized to bring action was held not a party in interest and therefore not competent to bring an action for the defining of rights. In Utah the engineer has begun surveys and the collection of data preparatory to beginning an action in the court, but has not proceeded far enough for the law to be ruled upon by the court. In the other States the laws have not yet become effective. There is a difference in detail in these States, which, however, does not seem to affect the main question on which the Idaho law was declared void. In Utah the engineer is to submit the data collected to the clerk of the court in some one of the counties in which the stream lies, while in the other States the data is to be turned over to the attorney-general, who is then to begin an action in the name of the State.

It appears, then, from a study of the operation of the laws for defining water rights in the various States that so far the only effective means of securing a complete list is to have the work done by an administrative board or official, subject to review by the courts. The provision contained in the newer laws for the bringing of actions by the attorney-general in the name of the State may prove effective, but it seems doubtful in view of the decision against the Idaho law.

In the States which have provided a system for supervising the acquirement of rights the necessity for adjudicating existing rights will in a few years pass away, since all new rights will be defined as they are acquired, and, naturally, the time will soon come when all rights acquired before the passage of the laws providing for supervision of the acquirements of rights will have been defined. In the States where rights are still acquired by appropriation the necessity for a system of defining rights will continue to exist.

The essentials of a system of controlling the acquirement of rights are the same as those for defining rights—accuracy and completeness. The systems adopted for securing a complete record are in general similar in the States which have adopted any system. There must be an application to the State

engineer, stating the intentions of the applicant and describing the works to be built, approval of this application by the State engineer, and submission of proof of having complied with the conditions of the approved application. For completeness this is all that is essential, and some States stop with this. Colorado, for instance, requires the engineer to approve any filing which contains a clear statement of what is claimed, while Idaho requires the engineer to approve any application which is made in proper form. Colorado, however, has no provision for inspection or proof of completion, and its requirement of filings by those wishing to appropriate water is of no value from the standpoint of furnishing a list of rights.

For accuracy most of the States require an examination of the plans submitted with the application and surveys or examinations of the completed works, and, in some States, of the land irrigated, in order that rights may be limited to the quantities of water which have been put to a beneficial use. Utah allows, instead of this examination, sworn statements by the applicant and two disinterested parties, although the engineer may make examinations if he deems it necessary. A compulsory examination by the engineer has its drawbacks. When the works are small or situated in remote districts the expense for examination is greater than is justified by the value of the rights. It has, therefore, been recommended in some States where examination is required that the engineer be allowed to accept sworn statements for remote and unimportant works, as is done in Utah. North and South Dakota and Oklahoma accept certificates of competent engineers for small works.

The engineers in several of the States have been given authority to reject applications for various causes. It should be noted that such authority is not necessary for the accomplishment of the main purposes of public supervision of the acquirement of rights. Both accuracy and completeness can be secured without this authority for rejection. It must be based, therefore, on reasons of policy outside of the main purpose of the law. The most common cause for rejection is the fact that there is no unappropriated water in the source of supply. It is an apparent absurdity to require the engineer to approve an application for the diversion of water from a stream which contains no water to which a right can be acquired. But there is something to be said in favor of approving application on streams which are already fully appropriated. The flow of a stream is not fixed, but increases and decreases from year to year, the flow in the latter part of the season almost universally increasing as the lands along its banks are irrigated, while the water requirements of land under irrigation have a tendency to decrease. The engineer is not, therefore, in a position to state that there is at any time no unappropriated water in a stream to which rights can be acquired. Decrease in use under existing rights, increase in flow due to seepage, and occasional supplies from unusually high floods may at any time furnish some supply for a new ditch. The Wyoming practice in regard to the rejection of applications upon this ground seems to be better than the Idaho practice. In Idaho the engineer approves all applications which are in proper form, making no reference to the supply which may be secured, while in Wyoming the engineer approves such an application, but stamps across the face of it a statement warning the applicant that the stream is very largely appropriated; that there is doubt as to his being able to secure any water, and that he must not interfere with existing rights. This system gives warning to the applicant, but at the same time allows him to proceed with construction if he thinks the chance of securing water is great enough to justify him in building works. If the works are built he will be in a position to take advantage of any supply which may become available on account of more economical use, return seepage, or wet seasons.

Most of the States give the engineer authority to inquire into the feasibility of the project and the conformity of the plans to correct engineering principles. This is justified as a protection to property, and is a desirable exercise of public supervision.

The engineers are also given authority to inquire into the financial ability and good faith of applicants. With the exception of Idaho none of the States goes into any detail on this matter. Idaho requires the filing of a bond as a guaranty of good faith. Without such inquiry by the engineer or the filing of a

bond as required in Idaho, it is possible for parties having no means for carrying out works or those wishing merely to delay or hold up some legitimate project to file applications which are purely speculative, without any intention or ability to build works. The protection of the State's resources makes it essential that there should be some such check upon speculative filings. The Idaho requirements for the filing of a bond and payment of a filing fee of 10 cents for each cubic foot per second after the first seem to be preferable to general authority for the State engineer to inquire into the financial ability and good faith of the applicant, since the exercise of this authority by the engineer subjects him to charges of favoritism, and leads to ill feeling on the part of those whose applications are rejected.

Wyoming, the pioneer State in providing for the public supervision of the acquirement of rights, gives the engineer authority to reject applications which are contrary to public policy. This has been followed by most of the States which have adopted codes in recent years. This provision is so general in its terms that it may be interpreted to mean much or little. In Wyoming charges of favoritism were made against the engineer, and the exercise of this authority has given him a great deal of trouble. The engineer of Nevada holds that this provision gives him no authority to reject applications which conform to the general rules of the office. The Utah engineer held that this provision gave him authority to choose between possible uses and refused an application for a use which in his opinion was not the best possible use of the water. Appeal was taken to the courts, the engineer was overruled in this matter, and at the next session of the legislature the law was repealed. In the other States which have adopted this provision the law is not yet effective. It appears, therefore, that this law is either ineffective or unpopular with both the engineers and the public. It seems very doubtful whether such discretion or such a burden should be put upon an officer, as it leaves room for charges of discrimination and appeals to the courts. It seems to be better to leave to the legislature the determination of what is good public policy, making the engineer a strictly administrative officer, who is to see that these principles are enforced.

Rights may be transferred in all of the States with the possible exception of Nebraska. In order that the list of rights may at all times be correct, it is necessary that these transfers be recorded with the State engineer. Correctness and accuracy require nothing more than this. It is, however, a fundamental part of the law of transfers that they can be made only when the rights of others are not injured. Originally there was no provision for determining in advance of the transfer whether the rights of others would be injured thereby. The usual procedure was to make the transfer, after which those claiming to be injured were compelled to bring action to prevent it. This placed the burden of determining whether a transfer might be made upon those who might be injured rather than upon those who are to receive the benefit. Recognizing this, Colorado requires that the party wishing to make a transfer apply to the court having jurisdiction of the stream, and the transfer is allowed only after a hearing similar to that held in connection with defining rights. Idaho, Nevada, North and South Dakota, and Oklahoma require that application must be made to the State engineer, who is to hold hearings, after a proper advertisement, and determine in advance whether a proposed transfer can be made without injury to other rights. Wyoming gives the engineer authority to recognize a transfer or refuse to do so, after which either party may appeal to the court. Since the question whether the transfer of a right will injure others is entirely one of physical facts and does not involve any legal questions, it seems that this matter is more properly left with the State engineer, who is a hydraulic engineer, than with the courts. The essential requirements regarding transfers are that there shall be a record and that it shall be determined in advance whether the rights of others will be injured.

Having a complete list of all rights to water, the officer charged with its distribution needs also a knowledge of the supply with which to satisfy these rights, and all the States having engineers provide for the making of stream gaugings. It is also essential that he have means of measuring accurately the quantity of water delivered, and means of controlling this. Most of the States have provided for this by requiring ditch owners to put in head gates and

measuring devices on the request of the water officials. Various means of enforcing this provision, in case the owners refuse to put in the structures, have been tried, such as having the official put them in and collect the cost through the county commissioners or by suit in the court, or having the county commissioners put in the structures and tax the cost against the property of the ditch owner. All such systems have proved ineffective, partly because county commissioners are apt to be in sympathy with the ditch owners and refuse to act, and partly because of the delay which is unavoidable where so many different agencies are required to act. The only provision which has been uniformly effective is giving the water officials power to refuse to deliver water to parties who do not comply with their orders within a reasonable time.

While the systems of distribution in the various States having public officials for this purpose differ in detail, they are in general the same. The essential thing is that the districts be as nearly independent as possible, and that all rights which are in any way interdependent come within the jurisdiction of a single official. Colorado was the first State to provide for this, and its system is still the model. The State is divided into divisions formed on drainage lines, each of which is entirely independent, putting each stream system under the control of a single division engineer. These are subdivided into districts which are also formed on drainage lines, but are not entirely independent. Each of these districts is served by a commissioner, who is under the general direction of the division engineer. The methods of meeting the cost of distribution differ widely. In some States it is paid by the counties and in others assessed against those using the water. This does not seem to be a matter of great importance. It may very properly be assessed against the users of the water, since they are the principal beneficiaries of the work, or it may be paid by the county as a sort of bonus to the industry, justified on the ground of the great public benefit derived.

TABULAR SUMMARY.

Public control of water, 1905.

| State or Territory. | Defining of rights. | Acquirement of rights. | | Distribution. |
|---------------------|---|-------------------------|-------------------------------------|-------------------|
| | | Initiation. | Proof of completion. | |
| Arizona..... | No provision..... | Post and file notice. | No provision... | No provision. |
| California..... | do..... | do..... | do..... | Do. |
| Colorado..... | Courts, on application of interested party. | do..... | do..... | Public officials. |
| Idaho..... | Courts—surveys by State engineer when ordered by court. | Application for permit. | Inspection by State engineer. | Do. |
| Kansas..... | Courts..... | Post and file notice. | No provision..... | Court officers. |
| Montana..... | Courts—all claimants parties; no surveys. | do..... | File maps..... | Do. |
| Nebraska..... | Administrative—secretary, board of irrigation. | Application for permit. | Sworn statement and inspection. | Public officials. |
| Nevada..... | Administrative—State engineer. | do..... | Rules not made.. | Do. |
| New Mexico..... | Administrative—board of control. | File notice..... | No provision.... | No provision. |
| North Dakota..... | Courts—surveys by State engineer. | Application for permit. | Inspection by State engineer. | Public officials. |
| Oklahoma..... | Courts—surveys by Territorial engineer. | do..... | Inspection by Territorial engineer. | Do. |
| Oregon..... | Courts—surveys by State engineer when ordered by court. | Post and file claim. | No provision..... | No provision. |
| South Dakota..... | Courts—surveys by State engineer..... | Application for permit. | Inspection by State engineer. | Public officials. |
| Utah..... | do..... | do..... | Sworn statements | Do. |
| Texas..... | No provision..... | File notice..... | No provision..... | No provision |
| Washington..... | Courts—on application of any interested party. | Post and file notice. | do..... | Public officials. |
| Wyoming..... | Administrative—board of control. | Application for permit. | Inspection by superintendent. | Do. |

Irrigation officials in the arid States, 1905

| Officials. | Appointed by— | Term. | Salary. | Paid by |
|--------------------------------------|---------------------------|--------------------|------------------------|------------------------|
| Colorado: | | | | |
| State engineer..... | Governor..... | 2 years..... | \$3,000 per year..... | State. |
| Division engineers..... | do..... | do..... | \$125 per month..... | Do. |
| Water commissioners..... | do..... | Not fixed..... | \$5 per day..... | Counties. |
| Idaho: | | | | |
| State engineer..... | do..... | 4 years..... | \$2,000 per year..... | State..... |
| Water commissioners..... | do..... | 6 years..... | \$10 per day..... | State and counties. |
| Water masters..... | Water commissioners..... | 1 year..... | \$4 per day..... | Users. |
| Kansas: Water bailiffs..... | Courts..... | Not fixed..... | \$2 per day..... | Counties. |
| Montana: | | | | |
| State engineer..... | Governor..... | 4 years..... | \$2,500 per year..... | State. |
| Water commissioners..... | Courts..... | Indeterminate..... | Not fixed..... | Users. |
| Nebraska: | | | | |
| Secretary State board..... | State board..... | 2 years..... | \$2,000 per year..... | State. |
| Under secretaries..... | do..... | do..... | \$5 per day..... | Do. |
| Under assistants..... | do..... | do..... | do..... | Counties. |
| Nevada: | | | | |
| State engineer..... | Governor..... | Not fixed..... | \$2,400 per year..... | State. |
| Water commissioners..... | State board..... | do..... | Not fixed..... | Counties. |
| North Dakota: | | | | |
| State engineer..... | Governor..... | 4 years..... | \$2,500 per year..... | State. |
| Water commissioners..... | do..... | 6 years..... | \$10 per day..... | Do. |
| Water masters..... | Water commissioners..... | Indeterminate..... | \$4 per day..... | Users. |
| Oklahoma: | | | | |
| Territorial engineers..... | Territorial engineer..... | ..... | \$3 per day..... | Users. |
| Water masters..... | do..... | ..... | ..... | ..... |
| Oregon: State engineer..... | Governor..... | 4 years..... | \$2,400 per year..... | State. |
| South Dakota: | | | | |
| State engineer..... | do..... | 6 years..... | \$2,000 per year..... | Do. |
| Water commissioners..... | do..... | do..... | \$5 per day..... | Do. |
| Utah: | | | | |
| State engineer..... | do..... | 4 years..... | \$3,000 per year..... | Do. |
| Superintendents..... | do..... | ..... | ..... | ..... |
| Superintendents..... | State engineer..... | Indeterminate..... | Fixed by engineer..... | Do. |
| Supervisors..... | County commissioner..... | ..... | ..... | ..... |
| Washington: Water commissioners..... | do..... | do..... | \$3 per day..... | Counties. |
| ..... | ..... | 1 year..... | Not fixed..... | Do. |
| Wyoming: | | | | |
| State engineer..... | Governor..... | 6 years..... | \$2,500 per year..... | State. |
| Superintendents..... | do..... | 4 years..... | \$1,200 per year..... | Do. |
| Water commissioners..... | do..... | 2 years..... | \$5 per day..... | Counties. |
| Secretary board of control..... | Board of control..... | Indeterminate..... | \$1,200 per year..... | State. |

^aDuties prescribed but no provision for appointment.

Arizona

Salt River Project.

(Write Salt River Valley Water Users' Association, Phoenix, Ariz., or Board of Trade, Phoenix, Ariz.)

Through the construction of a dam 284 feet high at Roosevelt, 1,284,000 acre-feet will be impounded by 1909 and by means of a low dam, forty miles below, the water will be diverted into the canal system that the Government is installing to irrigate the 160,000 acres of land near Phoenix and Mesa, Arizona.

The water power developed at the Roosevelt dam will be used to pump additional water from underground sources.

The land is all under private ownership and is held at from \$60 to \$150 up depending on nearness to town, soil, water rights, etc. Water rights cost about \$30 and the maintenance charge has been about \$1.60 per acre per year, and will probably remain so.

Drinking water is reached at from 15 to 100 feet.

Altitude 1,000 to 1,300 feet. Rainfall 3 to 10 inches. Climate, semi-tropical, and in summer the temperature is high. Temperature ranges from 20 to 120 degrees.

Soil is an alluvial deposit of great fertility and varies from sandy loam to adobe.

Products are olives, oranges, pomelo, lemon, fig, pomegranate, grape, apricot, peach, plum, vegetables, alfalfa (six crops a year), grain, etc.

Ostriches, poultry, stock, cattle, hogs, etc., do well.

Southern Pacific and Santa Fe reach this project.

Under the Reclamation Act no one may own water for more than 160 acres of land. There has been no decision as to the issue of the Farm unit, other than this, under this project.

No one who is not a resident of the Salt River Valley may acquire water right. To obtain a legal residence in this territory, one has to reside there for one year. To retain a water right the owner must not permit the land to lie idle indefinitely. Non-use would work an abandonment and a loss of the right whether the holder may have previously patented his land and water right or not.

Sulphur Springs Valley.

(Write Willcox Land Co., or J. W. Engel, Willcox, Arizona.)

This Valley embraces over 800,000 acres of arable land in Cochise County all subject to the Homestead Act. Only 90,000 acres have been so taken up, though frequent filings are being made.

The soil is sandy loam bearing rich mineral and chemical fertilizers, and under proper irrigation produces a wide variety of crops, including grapes,

strawberries, small grains and alfalfa, which produces five or six crops per annum.

No general irrigation system exists, but an ample water supply is had from wells at a depth of from 15 to 35 feet. Artesian water has been developed at 160 feet.

Average rainfall 17 inches.

Altitude 3758 feet.

The Southern Pacific passes through the Valley. Willcox is the principal station.

Consolidated Canal Project.

The Consolidated Canal Company owns a tract of about 18,000 acres of fertile land a short distance from Mesa. They have an absolute water supply.

It is the intention of the company to open these lands to colonists in the very early future.

An attractive feature will be the construction of an electric railway which will traverse the land in such a way as to bring all portions of the land within a mile and a half of this transportation.

South Gila Project.

It has been reported that French capital has been secured for the resuscitation of the old South Gila project on the eastern edge of Yuma County. The proposed work will cover the building of a storage reservoir on the Gila and for irrigation works designed to cover about 200,000 acres of rich valley land.



Power Canal: Salt River Project.

Gila Bend Project.

Some years ago, that which is known as the Whiskey Trust indulged the installation of a large project in the neighborhood of the Gila Bend. The zone included a vast acreage of good land and there was a plentiful supply of water from the Gila. Through engineering errors an inadequate type of dam was constructed which was wholly unadapted to the conditions at the dam site. Experts have held that \$500,000 will be all that will be required for the construction of a permanent dam and movements are under way to finance such an undertaking.

Queen Creek Canyon Project.

Some years ago after investigation indulged by the Reclamation Service of the United States Government the project of placing a dam across the Queen Creek Canyon at the eastern end of the Superstition Mountains was abandoned. More recently Messrs. Hoyt, Young and Wakeman have again located this dam site and claimed 20,000 inches of the flow of Queen Creek. The dam site lies about 20 miles north of Florence.

CALIFORNIA-ARIZONA.

Yuma Project.

(Write Yuma County Water Users' Association, Yuma, Ariz., or U. S. Land Offices, Los Angeles, Calif., and Yuma, Ariz.)

By means of the Laguna dam about ten miles above Yuma the water of the Colorado River will be diverted into canals on either side of the river.

These canals will convey the water to irrigate about 84,000 acres in Arizona and 17,000 acres in the Yuma Indian Reservation in California.

Levees to protect the lands from overflow and a pumping system to remove the surplus water from the low-lands will be constructed.

All of the project lands in Arizona have been claimed. The Indian lands in California will not be opened for settlement until the system is finished about 1911. The plan for allotment has not been made public.

The maximum farm unit is 40 acres of average land. Units close to town or in favored sections contain a minimum of 10 acres.

Deeded land costs from \$30 to \$100 per acre, depending upon improvement, location, etc.

Water rights will cost about \$40 per acre. The charge for annual maintenance has not been decided.

The Southern Pacific reaches the project.

Vegetables, alfalfa, etc., are now grown. Semi-tropical fruits and products should do well.

Altitude at crest of Laguna Dam 151 ft.; at Mexican boundary 90 ft.; mesa lands 180 to 220 ft.

Temperature (from 1876 to 1907): 22 to 118 degrees.

California

The large irrigable areas of California are three in number. They consist of the great interior basin known generally as the Sacramento and San Joaquin Valleys, the area about Los Angeles and the valley known as the Colorado Desert. Beyond these three there is virtually no productive land in the State as the rest is largely rugged, mountainous wastes and arid alkali desert lands, with an occasional alluvial patch of ground. The interior basin heretofore referred to stretches from Tehama County on the north to Kern County on the south and the arable lands lie upon either side of the two rivers which have given their names to the northern and southern portions of the one great valley. These rivers meet just east of San Francisco and their waters empty into the waters of San Francisco Bay.

The rivers furnish water to irrigate the savannahs at their sides and it is by means of this irrigation that the land has been made productive.

Portions of Tehama, Glenn, Butte, Yuba, Sutter, Colusa, Yolo, Placer, Sacramento, Solano and Amador counties are a part of the Sacramento Valley.

The San Joaquin Valley includes portions of Contra Costa, San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare and Kern counties.

There are approximately 3,000,000 acres of irrigable land in the Sacramento and at least an equal amount in the San Joaquin Valley, much of which is now under cultivation.

There are probably 700,000 acres of irrigable land in the area about Los Angeles. This includes portions of Ventura, Los Angeles, San Bernardino, Orange and Riverside counties.

The irrigable lands of the Colorado desert, known generally as the Imperial and Coachella Valleys, including the California areas near Yuma, contain nearly 500,000 acres and are portions of Riverside and Imperial counties.

Besides the three great districts there are several smaller ones, but these are limited in number and extent.

The California Water and Forest Association has furnished a list of the irrigation projects in California, which has been compiled by Prof. Fortier, and is as follows:

IRRIGATION SYSTEMS IN CALIFORNIA.

By Prof. Samuel Fortier.

Following is a list of the canal and irrigation companies in California, arranged by counties, with a brief description of the more important canal systems. The information is that returned by the county assessors, supple-

mented by facts secured by the irrigation and drainage investigations of the United States Department of Agriculture. Some of the counties have furnished no reports.

Alameda County. (No report.)

Alpine County. (No report.)

Amador County. (None.)

Butte County. Butte County Canal Company. Diverts water from Feather River. Main canal thirty miles long; laterals aggregate about thirty miles. System when complete is capable of irrigating 160,000 acres. Cost, \$475,000.

Calaveras County. (No report.)

Colusa County. Roberts Ditch Company, Colusa, Cal., L. L. Hickok, president.

Central Canal and Irrigation Company, Willows, Cal., Chas. L. Donohoe, manager. Diverts water from Sacramento River and Stony Creek. System consists of forty-four miles of canal, sixty feet wide on bottom; twenty-five miles of main laterals, twenty-five feet wide; a 225-horse power motor and 44-inch pump.

Contra Costa County. (No report.)

Del Norte County. (No report.)

El Dorado County. (No report.)

Fresno County. Fresno Canal and Irrigation Company.

The San Joaquin and Kings River Canal and Irrigation Company.

Glenn County. Stony Creek Irrigation Company. Diverts water from Stony Creek. Length, nine and one-half miles; capacity, fifty cubic feet per second. Four hundred acres irrigated in 1906, but 14,000 acres under control.

Central Canal Company. (See Colusa County.)

Humboldt County. (None.)

Inyo County. Bishop Creek Ditch Company; George Watterson, secretary, Bishop, Inyo County, Cal.

Dell Ditch Company; W. J. Perry, secretary, Bishop, Inyo County.

Farmers' Ditch Company; John Dehy, secretary, Bishop, Inyo County.

Lone Pine Canal Company; E. Robinson, president, Independence, Inyo County.

McNally Ditch Company; J. La Grange, secretary, Laws, Inyo County.

Inyo Canal Company; J. E. Coffin, secretary, Whittier, Cal.

New Stevens Ditch Company; Mrs. C. G. J. Edwards, secretary, Lone Pine, Inyo County.

Owens River and Big Pine Canal Company; R. W. Thomas, secretary, Big Pine, Inyo County.

Rawson Ditch Company; T. M. Kendrick, secretary, Bishop, Inyo County.

Owens River Canal Company; Owen W. Larsen, secretary, Bishop, Inyo County.

Imperial County. California Development Company. Diverts water from Colorado River. Cost of main system was \$597,000 in 1906. There are nine mutual water companies properly organized which take water from the California Development Company.

Kern County. The Kern County Land Company. Diverts water from Kern River through several systems; one of these is the Calloway Canal, thirty-five

miles long and having a capacity of nine hundred cubic feet per second. Buena Vista Lake, a part of the Kern County Land Company's system, has a capacity of 170,000 acre feet and cost \$150,000. There are also some twenty-seven pumping plants operated by motors.

Kings County. (No report.)

Lake County. None. Yolo County Consolidated Water Company has some property in this county. This company is given under Yolo County.

Lassen County. Lassen Irrigation Company; W. E. Williamson, lawyer, San Francisco.

Lassen Willow Creek Water Company; C. E. Emerson, president, Susanville, Cal.

Los Angeles County. (No data.)

Madera County. Madera Canal and Irrigation Company; R. L. Hargrave, attorney and local manager, Madera, Cal. Sixteen thousand acres irrigated in 1906.

Marin County. (No report.)

Mariposa County. (No report.)

Mendocino County. (No report.)

Merced County. San Joaquin and Kings River Canal and Irrigation Company, Fifth and Howard streets, San Francisco.

Crocker-Huffman Land and Water Company, San Francisco.

East Side Canal Company, Newman, Stanislaus County, Cal.

The San Joaquin and Kings River Canal and Irrigation Company. Diverts water from the San Joaquin River for lands in Fresno, Merced and Stanislaus counties. Total length of main canal and principal laterals, one hundred and eighty-two miles.

Modoc County. (None.)

Mono County. (None.)

Monterey County. (No report.)

Napa County. (None.)

Nevada County. South Yuba Water Company; Geo. Scarfe, superintendent, Nevada City.

Excelsior Water Company; W. G. Halstead, superintendent, Smartsville.

Northern Water and Power Company; G. W. Starr, manager, Grass Valley.

Eureka Lake Company; J. S. McBride, superintendent, North San Juan.

Summit Water and Irrigation Company; J. S. McBride, superintendent, North San Juan.

Bay Counties Power Company; Geo. Scarfe, agent, Nevada City.

Truckee River General Electric Company; H. Fleishhacker, manager, Grant Avenue and Bush Street, San Francisco.

Orange County. Santa Ana Valley Irrigation Company; W. B. Sager, secretary, Orange, Cal.

Anaheim Union Water Company; P. H. Krick, secretary, Anaheim, Cal.

Placer County. South Yuba Water Company, Auburn, Cal.

North Fork Ditch Company; A. N. Buchanan, Sacramento, Cal.

Plumas County. (No report.)

Riverside County. Lakeview Water Company; Royal Hodson, secretary,

Lakeview, Cal.

Lake Hemet Water Company; P. N. Myers, secretary, Hemet, Cal.
Rubidoux Canal; H. C. Hibbard, secretary, Riverside, Cal.
Riverside Water Company; W. A. Correll, secretary, Riverside, Cal.
Gage Canal Company; Riverside Trust Company, managers, Riverside, Cal.
Stearns Ranchos Canal; C. W. Rogers, secretary, Douglas Block, Los

Angeles, Cal.

Temescal Water Company; C. M. Scoville, secretary, Corona, Cal.
New Bear Valley Irrigation Company; Mr. Spoor, manager, Redlands, Cal.
Sacramento County. (No report.)

San Benito County. Hollister Irrigation Company; N. C. Briggs, secretary,
Hollister, Cal.

San Bernardino County. (No data.)

San Diego County. Sweetwater Water Company, National City, Cal.

San Diego Flume Company, San Diego, Cal.

Escondido Mutual Water Company, Escondido, Cal.

Southern California Mountain Water Company.

San Francisco County. (None.)

San Joaquin County. Stanislaus Water Company; Chas. T. Tulloch, manager, Oakdale, Cal.

Stockton and Mokelumne Canal Company; E. L. Wilhoit, manager, Stockton, Cal.

San Luis Obispo County. (No report.)

San Mateo County. (None.)

Santa Barbara County. Union Sugar Company, Betteravia, Cal.

Santa Clara County. (No report.)

Santa Cruz County. (None.)

Shasta County. (No report.)

Sierra County. (None.)

Siskiyou County. (No report.)

Solano County. (None.)

Sonoma County. (None.)

Stanislaus County. The Modesto Irrigation District. The Turlock Irrigation District. Both divert water from the Tuolumne River. The former has one hundred and thirty-two miles of main canal and laterals, and the latter one hundred and fifty-four miles. The Modesto district includes 82,000 acres and the Turlock 258,210 acres.

Sutter County. (No report.)

Tehama County. (None.)

Trinity County. (None.)

Tulare County. (No report.)

Tuolumne County. Tuolumne County Water and Electric Power Company,
Sonora, Cal.

La Grange Hydraulic Mining Company, La Grange, Cal.

Big Creek General Mining Company, Groveland, Cal.

Stanislaus Electric Power Company, Vallecito, Cal.

Ventura County. San Antonio Water Company, Nordhoff, Cal.

Santa Paula Water Company, Santa Paula, Cal.

Ventura Water, Light, and Power Company, Ventura, Cal.

Santa Clara Water and Irrigation Company, Ventura, Cal.

Southside Improvement Company, Ventura (or Hueneme). Cal.

Thermal Belt Water Company, Santa Paula, Cal.
Fillmore Water and Irrigating Company, Fillmore, Cal.
Artesian Water Company, Santa Paula, Cal.
Vineyard Ditch Company, Ventura, Cal.
Mound Water Company, Ventura, Cal.

Yolo County. Yolo County Consolidated Water Company; J. Craig, president; L. D. Stephens, secretary, Woodland, Cal. Diverts water from Cache Creek and consists of the Moore, Capay, Adams, and Clear Lake Company's ditches.



STATE IRRIGATION DISTRICTS OF CALIFORNIA.

The present irrigation laws of California are based upon what is known as the Bridgford Act, which was approved March 31, 1897, superseding the Wright Act (with amendments), which had been effective since March 7, 1887, under which the Modesto and Turlock Irrigation Districts had been organized.

The Bridgford Act is entitled: "An Act to provide for the organization and government of irrigation districts, and to provide for the acquisition or construction thereby of works for the irrigation of the lands embraced within such districts, and, also, to provide for the distribution of water for irrigation purposes."

In brief this act provides that the majority of holders of irrigable lands in a certain section, which land is susceptible of irrigation from a common source, may unite in the formation of a co-operative irrigation company having that purpose in view.

This water company, after it has been formed in the manner provided by this act, is given the right to issue bonds to provide for the construction cost, such bonds to run for from twenty-one to thirty years, with interest at the rate of 5 per cent. per annum, and to be paid both as to principal and interest through assessments made upon the real estate within the district and such real estate to remain liable, at all times, for all of said payments.

The provision for maturing indebtedness is arranged through assessments levied by a regular assessor and collections are made in the same way as are taxes. The board of directors of the water company are constituted a board of equalization for the purpose of equalizing this assessment.

When the water user is unable to pay these assessments it is the right of the district to sell all or a portion of his property to liquidate this debt, and if a portion only is to be sold, the delinquent owner may designate that portion he wishes to retain.

The delinquent owner is allowed twelve months to redeem the property which has been so sold.

The right of eminent domain is given by this act and under the provision of the act the district may condemn lands, rights of way, etc., to the end of making the works which are constructed as efficient as is possible.

The irrigation works of the district are exempt from all state, county, or municipal taxation.

A provision is made for the uniform division of the water and arranging for its proration in times of scarcity and in many ways the application of just and equitable conditions are provided.

Some of the older irrigation districts are indulging other work for the common good, such as the drainage of low lands within the zone of the district and the construction of telephone lines for the use of the land holders.

It seems quite probable as the ultimate result of this community of interests which are bound together under the common joint ownership of the water supply—that thing most essential to the success of the western rancher—that other utilities will be developed by these different districts, each acting independently and for the joint benefit of its peoples, and that each of these

will be the home of contented peoples living as one great family, each member of which derives recompense in proportion to his individual work and ability and all sharing together in the emoluments and benefits resulting from their community of interests as centralized in the control of the district organization in which each has a part.

The irrigation districts of California are as follows:

District 1. Lands about Susan River and Honey Lake.

- | | | | | |
|---|----|---|---|---|
| " | 2. | " | " | Yuba River. |
| " | 3. | " | " | Cache Creek and Clear Lake. |
| " | 4. | " | " | Fresno River and headwaters of San Joaquin River. |
| " | 5. | " | " | Kings River. |
| " | 6. | " | " | Salinas River. |
| " | 7. | " | " | Los Angeles Creek. |
| " | 8. | " | " | San Jacinto River. |
| " | 9. | " | " | Sweetwater River. |

THE SACRAMENTO VALLEY.

The Sacramento Valley has had the careful investigation of the best experts employed by the United States Reclamation Service, and they have been unanimous in their declaration that the Sacramento Valley has the greatest irrigation opportunity in the United States. They have been led to this conclusion by the material factors that enter into the success of such undertaking and have noted the magnitude of the area, the abundant water supply, the unusual number and capacity of the natural storage basins and the great fertility of the soil, as well as the material benefits of a California climate.

The greatness of this territory may be appreciated when it is known that these Federal Reclamation Engineers found that the irrigable land covers 2,661,120 acres and the annual discharge of the Sacramento River at its mouth is 26,000,000 acre feet—enough to cover all of these lands to a depth of more than nine feet.

The plans, however, contemplate the impounding of much of the water needed for irrigation as less than one-fourth of the total flow occurs during the months from May to September, inclusive, when the most water is required for irrigation.

It has been found that at a cost of \$5,800,000 eight reservoirs can be constructed which will impound 1,541,020 acre feet—an average cost of \$3.76 per acre foot—and this will serve to augment the usual low water flow to the extent of from 2,500,000 to 3,000,000 acre feet annually.

The unirrigated lands are now held at from \$15 to \$50, and with irrigation these same lands are worth from \$100 to \$200 and upwards per acre.

It was about 1900, at the time the U. S. Geological Survey of this portion of California was under way that the salient facts above referred to were brought to the attention of the United States Reclamation Service, and since then that department has co-operated with the State of California and certain quasi-public organizations in the attainment of the end in view. The State Legislature has made large appropriations and has co-operated with the Reclamation Service and the Water and Forest Associations, the Sacramento Valley Association and the several local Chambers of Commerce in the general

development of the several projects having in view the irrigation of the entire valley. The first work was undertaken through the aid of a small fund secured by subscription made by the people of the valley and since then the work has been enlarged and the valley has been completely surveyed and stream measurements have been made as well as selection and measurements of storage basins, plans and estimates for dam construction as well as topographical surveys of the valley floor.

The great problems of the valley are irrigation and drainage and at the same time this former must be indulged in such a way as not to interfere with navigation—an interest of importance.

The Reclamation experts hold that by impounding the flood waters the uniform flow of the river will be enforced and this besides aiding irrigation will prevent the overflow of the bottom lands and the disastrous highwater periods which have injured navigation in the past. It is not expected that this work will solve the problem of efficient river control but it will aid greatly and render future supplemental work easier and more efficacious.

It is estimated that the areas subjected to overflow approximate 1,000,000 acres, hence the importance of proper river control is apparent.

U. S. RECLAMATION ENTERPRISE

Orland Project.

(Write Project Engineer U. S. Reclamation Service, Orland, Calif.; Orland United Water Users' Association, Orland, Calif.)

Orland, like the Garden City project in Kansas, has as its zone lands that are wholly in private ownership. It includes some 30,000 acres in the Sacramento Valley, about 12,000 acres of which will be reclaimed. It is in Glenn and Tehama Counties.

The soil varies. In the eastern part near Hamilton City it is sandy loam; to the west of this is a loam of coarser texture, next is a gravelly loam and to the northwest is a loam of a different texture.

The farm unit is 40 acres. Deeded land is held at from \$25 to \$100 per acre, depending upon the character of the soil and the location.

Constant residence within 20 miles of this land is required.

The water right will cost about \$45 payable in ten annual installments of \$4.50 each. The annual maintenance charge is 75 cents per acre.

Altitude 250 feet. Rainfall 17 inches. Temperature ranges from 26 to 121 degrees.

Products are alfalfa, oranges, lemons, limes, grapes, almonds, berries, and deciduous fruits.

Orland is the principal town.

This land is on the Southern Pacific Railway.

SYNDICATAL ENTERPRISES.

There are numerous syndicalat enterprises of varying importance which are located throughout the irrigable sections of California. The following has been selected as illustrative of conditions around the fertile ranch lands near Los Angeles.

East Whittier Land & Water Co., Whittier, Calif.

Area irrigated: 10,000 acres.
Cost of irrigating: \$750,000.
Completed: 1906.
Soil: black and sandy loam.
Cost of lands: \$150 to \$600.
Residence not required.
Water stock cost per acre: \$75.
Annual maintenance charge per acre: \$6.00.
Farm unit limit: none.
Altitude: 250 feet.
Rainfall: 12 inches during winter months.
Temperature: 30 to 96.
Products: oranges, lemons and walnuts.
Railroads: Southern Pacific and Pacific Electric.
Towns near lands: Los Angeles and Whittier.

Atwater Project.

(Write Crocker-Huffman Land & Water Company, San Francisco, Calif.)

The water of the Merced River is diverted just below Merced Falls, and by a system of canals and tunnels is conveyed to a large artificial lake or reservoir where it is impounded and from thence is distributed throughout the Atwater and Livingston districts which lay to the northwest as well as to those sections to the south and southeasterly.

The system is designed to irrigate 220,000 acres and between 40,000 and 50,000 acres are now being served with water.

Thus far \$2,000,000 has been expended in this work.

Besides the cost of the land the water-user pays \$10 per acre for a water right, such payment being made in cash or in annual installments of \$2 each for five years.

The irrigating charge is \$1.00 per acre per year.

The products are vegetables, fruits, nuts, etc.

Railroads: Southern Pacific and Santa Fe.

Palo Verde Valley.

(Write Palo Verde Land & Water Company, Blythe, Riverside Co., California).

Irrigable area amounts to about 40,000 acres.

Water is taken from Colorado River, under an appropriation of 300,000 inches.

A canal system consisting of 12 miles of main ditch and 4 miles of laterals is now in use. Capacity of main canal 500 second feet. Fifteen miles of additional canal contracted for.

The Company gives with each acre of land one share of Palo Verde Mutual Water Company's Stock. The water company sells permanent water rights to settlers on government land at \$12.00 per acre.

Table and raisin grapes, root crops, legumes and alfalfa are grown. Successful experiments have been made with growing cotton, fruits and sugar beets.

The soil is sedimentary, uniform and very fertile.

Rainfall 3 inches per annum; maximum temperature 110, minimum 22.

Altitude 299 to 375 feet.

The Valley is accessible by tri-weekly stage from Glamis on Southern Pacific 64 miles, and by occasional steamer on the Colorado River from Parker on Santa Fe to Ehrenberg 50 miles.

San Joaquin Valley.

(Kern County Land Company.)

(Write Kern County Land Company, Bakersfield, California).

This company owns and operates a system capable of serving 150,000 acres.

75,000 acres are now under cultivation, being devoted largely to alfalfa, fruit and grain.

Kern River and Paso Creek, the flow of which is practically all under control of the company, furnish water supply.

Soil: black tule land and sandy loam.

Raw land under ditches, in lots of 20 to 40 acres, varies in price from \$50 to \$300, according to quality and location.

Altitude 400 feet.

Average rainfall $4\frac{1}{2}$ inches, precipitation occurring from October to April.

The average winter temperature is 40 to 50; summer 85 to 95. Extremes of 26 and 115 are sometimes, though rarely, reached.

The property is served by the Southern Pacific Company at Bakersfield, Gosford and Wible Orchard stations; and by the Santa Fe Railway at Bakersfield.

Alta Irrigation District.

(Write Board of Directors, Alta Irrigation District, Dinuba, California).

This irrigation system is controlled by the people who are assessed on acreage basis for its maintenance. Assessment for 1909 amounted to \$58,297.43 or an average of 45c. per acre.

The district has an appropriation of 500 second feet of water from the Kings River.

The irrigation district covers an area of 130,000 acres.

Raw land varies in price from \$50 to \$250 per acre, according to location and soil: improved land from \$125 to \$1000 per acre, depending on location and crop.

The soil is a heavy red adobe and sandy loam.

Alfalfa, grapes and orchard fruits are raised.

Altitude 335 feet.

Rainfall 7 to 8 inches per annum.

Temperature ranges between 24 and 110 as extremes. Average 67.

Railway facilities are afforded by the Southern Pacific at Reedley, Dinuba and Monson; by the Santa Fe at Reedley, Dinuba, Sultana and Cutler.

Fresno Canal & Irrigation Company and Fresno Consolidated Canal Company.
(Write L. A. Nares, President, Fresno, California).

These systems, which are under the same management, serve an area of 400,000 acres.

Price of raw land varies from \$40 to \$150 per acre: improved land \$100 to \$500 per acre.

Soil east and north of Fresno is red clay; south and west, white sandy loam. A large part of the Laguna de Tache lands and lands along what is known as First Slough have black sedimentary soils.

Water is obtained from the Kings River, of which the entire flow, with the exception of 500 second feet taken by the Alta Irrigation District, is available. Cost of water per year per acre varies from 62½ to 75c.

Crops include alfalfa, corn, table and raisin grapes and peaches.

Altitude 290 feet.

Rainfall 7½ inches.

Temperature infrequently reaches extremes of 24 and 115, average 69.

The Southern Pacific and Santa Fe afford railway facilities.

Crocker-Huffman District.

(Write Crocker-Huffman Canal Company, Merced, California).

This district contains 20,000 acres of irrigable lands, consisting of white sandy loam and black adobe.

Raw land varies in price from \$60 to \$125.

Alfalfa, tree fruits and grapes are raised.

With the exception of 50 second feet this company controls all of the flow of the Merced River.

Altitude 171 feet.

Rainfall 10 to 12 inches.

Temperature ranges between 24 and 110 as extremes, average 67.

The Southern Pacific and Santa Fe Railways serve the district.

Turlock Irrigation District.

(Write Board of Directors, Ceres, California).

There are 176,210 acres of land under this system.

Soil: consists largely of white sandy loam.

Raw land sells at from \$75 to \$300 per acre.

Among the crops raised are grapes, deciduous fruits and alfalfa.

1500 second feet of water are obtained from the Tuolumne River.

The district was formed by voting bonds and all property is subject to a tax of about \$2.50 per \$100 assessed valuation, making cost of water from 75 to 80c. per acre. The district is controlled by a board of directors elected by the people.

Altitude 106 feet.

Rainfall 12 inches.

Extremes of temperature 26 and 110; average 68.

Railway facilities are provided by Southern Pacific and Santa Fe.

Modesto Irrigation District.

(Write Board of Directors, Modesto, California).

Area under system 82,000 acres.

Price per acre for raw land \$75 to \$300.

Soil largely white sandy loam.

Crops include grapes, deciduous fruits and alfalfa.

Water supply consists of 1500 second feet from the Tuolumne River.

The district is bonded and subject to tax of \$2.50 per \$100 assessed valuation, making cost of water 75 to 80c per acre. District controlled by Board of Directors elected by the people.

Altitude 91 feet.

Rainfall 12 inches.

Temperature ranges between 26 and 110 extremes, average 68.

Railway facilities provided by Southern Pacific and Santa Fe.

Butte County Canal.

(Write Sacramento Valley Canal Company, San Francisco, California).

The 150,000 acres under this system lie in Butte and Sutter Counties, 51 miles from Sacramento, 23 miles from Chico and within ten miles of Yuba City, Marysville and Oroville.

Soils are largely of an alluvial nature.

Crops include alfalfa, oranges, olives and other orchard fruits.

Water rights on the Feather River cover an abundant supply.

Altitude 65 to 190 feet.

Rainfall 18 to 27 inches.

Average temperature 64.

Served by Southern Pacific and Northern Electric Railways.

Yolo County Consolidated Irrigation District.

(Write Joseph Craig, Woodland, California).

Lands in this district in Yolo County, may be had at from \$75 to \$250 per acre.

The soil is considerably diversified and is adapted to such crops as alfalfa, grains, citrus and deciduous fruits and nuts.

Water is obtained from Clear Lake, Cache and Putah Creeks.

Rainfall 16 to 18 inches.

Altitude 51 to 65 feet.

Average temperature 60 to 63.

The district is adjacent to the Southern Pacific Railway.

Los Molinos Land Company.

(Write L. G. Sinnard, General Manager, Los Molinos, California.)

This tract, situated in Tehama County, comprises 12,000 acres for sale at from \$125 to \$200 per acre, with perpetual water right.

The soil is a sandy loam adapted to alfalfa, grains, citrus fruits, deciduous fruits and nuts.

Water is taken from the Los Molinos River.

Altitude 300 feet.

Rainfall 25 inches.

Average temperature 62.

The land is contiguous to the Southern Pacific Railway.

Fair Oaks District.

(Write Geo. P. Robinson, Fair Oaks, Sacramento Co., California.)

This district, containing 7,000 acres is 17 miles from Sacramento.

The land is a red sandy loam suitable for oranges, lemons, olives, grapes and other fruits.

Water is taken from the American River.

Altitude 125 feet.

Rainfall 20 inches.

Average temperature 60.

Served by Southern Pacific Railway.

Central Canal.

(Write C. M. Wooster, 702 Market St., San Francisco.)

When completed the Central Canal will irrigate 250,000 acres in Glenn and Colusa counties.

Soils of wide variety are found in this section. Practically any California crop can be raised.

Lands are held at \$75 to \$150 per acre.

Water is obtained from Stony Creek and the Sacramento River.

Altitude 132 feet.

Rainfall 21 inches.

Average temperature 60 to 65.

Colusa and Willows are the nearest important towns. The district is served by the Southern Pacific Railway.

Surprise Valley Project.

(Write Surprise Valley Power and Irrigation Company, Reno, Nev.)

Surprise Valley is in Modoc County in the extreme northeastern portion of California. It has an average width of 10 miles and is 65 miles in length. It is proposed to convey the waters of Cow Head Lake, supplemented by floodwaters impounded by damming a wide canyon, through a system of tunnels and ditches to the fertile lands of the valley so that 50,000 acres may be placed under irrigation.

It is the intention of the company to place the land under canals and sell water rights at from \$20.00 to \$25.00 per acre (payable in 10 annual installments) to the holders of the lands so served.

Products: Fruits, grains, grasses, stock, etc.

Towns: Ft. Bidwell, Cedarville, Lake City and Eagleville.

Railroads: N. C. & O. via Alturas.

Soil: Lava ash and black sandy loam with but little alkali.

Colorado

The State of Colorado does not keep its irrigation statistics in concise shape, hence general information is not now available.

The State is divided into four general divisions, and subdivided into sixty water districts, each in charge of a separate Water Commissioner.

If detailed information is desired as to any of these districts, one should apply to the Water Commissioner at the town mentioned hereafter which is closest to the lands concerning which information is required.

The following table gives the addresses of the present Water Commissioners:

Water Commissioners of Colorado for the Year 1908.

| Dist. No. | Div. No. | Name | Address | Colo. |
|-----------|----------|---------------------------|----------------|-------|
| 1 | 1 | Charles I. Colwell | Fort Morgan, | Colo. |
| 2 | 1 | Charles M. Jump | Platteville | " |
| 3 | 1 | John L. Armstrong | Fort Collins | " |
| 4 | 1 | Oswald Allen | Loveland | " |
| 5 | 1 | A. L. Gibson | Longmont | " |
| 6 | 1 | Edward Autroy | Boulder | " |
| 7 | 1 | W. M. Davis | Edgewater | " |
| 8 | 1 | S. F. Couch | Littleton | " |
| 9 | 1 | John W. McLean | Morrison | " |
| 10 | 2 | William Frizzell | Manitou | " |
| 11 | 2 | William Young | Nathrop | " |
| 12 | 2 | John Kille | Rockvale | " |
| 13 | 2 | Frank Kelling | West Cliff | " |
| 14 | 2 | Robert Burton | Boone | " |
| 15 | 2 | Lewis Harris | Rye | " |
| 16 | | John J. Wright | Walsenburg | " |
| 17 | 2 | S. W. Cressy | Rocky Ford | " |
| 18 | 2 | James S. Calderhead | Gulare | " |
| 19 | 2 | E. G. Duling | Trinidad | " |
| 20 | 3 | George C. Widman | Monte Vista | " |
| 21 | 3 | G. S. Lovett | La Jara | " |
| 22 | 3 | | Manassa | " |
| 23 | 1 & 2 | David Collard | Fairplay | " |
| 24 | 3 | J. P. Sanchez | San Pablo | " |
| 25 | 3 | Frank Gargo | Villa Grove | " |
| 26 | 3 | W. B. Donnel | Saguache | " |
| 27 | 3 | Feles Chares | Saguache | " |
| 28 | 4 | J. R. Hicks, Jr. | Sargents | " |
| 29 | 4 | R. H. Bostwick | Pagosa Springs | " |
| 30 | 4 | John Cundiff | Bayfield | " |
| 31 | 4 | | | |
| 32 | 4 | | | |
| 33 | 4 | John Cunningham | Hesperus | " |
| 34 | 4 | H. M. Barber | Mancos | " |
| 35 | 3 | Max Atencio | Fort Garland | " |
| 36 | 5 | H. H. Hill | Plains | " |

| | | | | |
|----|---|---------------------------|-------------|---|
| 37 | 5 | N. W. Nelson | Gypsum | " |
| 38 | 5 | Charles H. Harris | Carbondale | " |
| 39 | 5 | D. E. Eskins | Rifle | " |
| 40 | 4 | George Hider | Cedar Edge | " |
| 41 | 4 | W. O. Hersum | Olathe | " |
| 42 | 4 | Walter Farmer | Whitewater | " |
| 43 | 5 | J. M. Clark | Meeker | " |
| 44 | 5 | Arthur Collum | Axial | " |
| 45 | 5 | Alvin H. Soule | Rifle | " |
| 46 | 1 | Sam E. Seville | | |
| 47 | 1 | W. D. Beckwith | Walden | " |
| 48 | 1 | Walter G. Decker | Larimer Co. | " |
| | | P. O. Address: Jelm, Wyo. | | |
| 49 | 2 | Bert Ragan | Landsman | " |
| 50 | 5 | | | |
| 51 | 5 | | | |
| 52 | 5 | C. B. Rundell | Sheephorn | " |
| 53 | 5 | A. R. Plowman | McCoy | " |
| 54 | 5 | | | |
| 55 | 5 | | | |
| 56 | 5 | | | |
| 57 | 5 | | | |
| 58 | 5 | John B. Souther | Yampa | " |
| 59 | 4 | | | |
| 60 | 4 | C. H. Smith | Coventry | " |

Uncompahgre Project.

(Write Uncompahgre Water Users' Association, Montrose, Colo.; or Delta County Business Men's Association, Delta, Colo.)

By means of cement-lined tunnels measuring 10½ by 11½ feet and extending nearly six miles, the waters of the Gunnison River will be conveyed through a divide 8,700 feet high into Uncompahgre Valley, where it will be utilized for the irrigation of 150,000 acres in Montrose and Delta Counties. Work on this huge bore was begun in 1904 and in 1908 it was half completed and it will be finished about May 1st, 1909, when 50,000 acres will be served.

About 20% of the land is subject to entry under the reclamation act. The farm unit will probably be 40 acres for fruit land and 80 acres for farming land.

Fruit orchards 12 years old have produced from \$400 to \$500 per acre. Sugar beets net from \$50 to \$80 per acre. Hay, 5 tons; wheat, 50 bushels; oats, 85 bushels; sugar beets, 15 to 30 tons per acre.

Deeded lands cost from \$35 to \$100 and up to \$500 per acre.

Continual residence is required.

Water rights will cost about \$35 per acre probably in from 5 to 10 annual installments. The annual maintenance charge has not been decided.

The altitude is about 5500 feet. Temperature: 10 to 98 deg. above zero.

Rainfall, from 6 to 11 inches.

The lands are reached by the D. & R. G. R. R. and the principal towns are Delta, Montrose, Olathe, Cedaredge, California Mesa, Cory and others.

Markets: Chicago, St. Louis and the West.

There are about 80,000 acres of gray lands and the balance is about evenly divided between red lands with light gravelly soil and uneven broken lands that are hardly susceptible of irrigation.

Grand Valley Project.

(Write Chamber of Commerce, Grand Junction, Colo.; or U. S. Reclamation Service, Grand Junction, Colo.)

In the Grand Valley of Colorado there are about 150,000 acres of arable land. About 50,000 acres of this will be included within the zone of the Grand Valley Irrigation Project, which will be ready for the service of water by 1911 or 1912.

The water cost has not been decided but will probably be a trifle less than \$50 per acre, payable in 10 annual installments.

The maintenance cost will probably not exceed 50 cents per acre per year.

The farm unit has not been fixed, but will doubtless run from 20 to 80 acres.

The soil varies from adobe, through lighter varieties to red mesa sandy loam.

The surveyors are now (August, 1908) at work and it is probable that construction work will be begun early next year and two or three years thereafter the system will be completed.

Deeded lands are held at from \$40 to \$250 per acre without water. There is some public land in the project, but it has been withdrawn from entry and farms cannot be filed upon until it has been thrown open for homesteading.

Grand Junction, Fruita, Loma and Mack are on or near the project.

Products are deciduous fruits, berries and grapes. There are probably 6,000 acres of fruit orchards now in bearing in the Grand Valley.

Altitude: 4600 feet. Rainfall: 11 inches.

Railroads: D. & R. G. and Colorado Midland.

Beaver Creek Project.

A large private reclamation project is being installed near Florence, Colorado. The impounded flood waters of Beaver Creek are conveyed by a great cement flume, whose installation cost exceeds \$70,000, for a distance of about 35 miles and 7,000 acres of land are so irrigated.

The land is notably suited for apple raising, being classed as shale soil, and is largely in private ownership.

The Julesburg Project.

An enterprise to irrigate 40,000 acres and upward; work completed last spring; first water used last summer; cost \$800,000, includes Jumbo reservoir; land increased in value from \$10 to \$50 an acre before first payment on bonds.

North Sterling Project.

Cost \$2,000,000; to irrigate 70,000 acres; has canal fifty miles long and two great reservoirs; one of these has dam one mile long and 100 feet high and covers 2,000 acres.

Bijou District, Fort Morgan.

Work completed last summer; first water used in season of 1908; cost of enlargement, \$500,000; 20,000 acres added to cultivated area; Empire reservoir covers 3,000 acres; dam between five and six miles long; canal 25 miles long.

Settlement to Bijou System.

District formed to irrigate 40,000 acres; bonds of \$750,000 issued; work completed last summer; total area under water.

Riverside District.

Great Riverside reservoir just completed; 40,000 acres added to area irrigated by this system; cost \$1,400,000; total served by system, 70,000 acres.



Prune Orchard on Uncompahgre Project.

Nile System.

Bond of \$700,000 voted; will dam Bijou creek; by means of settling basins will make great annual run-off available for farmers around Hoyt and Wiggins; 30,000 acres to be reclaimed.

Badger Creek District.

Just being organized; will reclaim 16,000 acres; cost \$300,000; to use water of Badger Creek.

San Arroyo District.

Sixteen thousand acres to be reclaimed; reservoir to hold 24,000 acre feet; work started.

Crow Creek Project, North of Greeley.

To gather waters of Crow Creek into reservoir and reclaim 20,000 acres; district organized; bonds voted.

Laramie—North Colorado Project.

One of the biggest ever conceived in Colorado; water of the Laramie river, a stream as large as Poudre, edge of the divide that separates the Poudre watershed from that of the Laramie; will irrigate 100,000 acres or more north of Greeley and Fort Collins in Weld and Larimer counties; part of the great diversion canal will run through Wyoming, but will swing south and deliver its waters into Colorado; plans all completed; irrigation districts will be organized to furnish bonds.

Boyd Lake, Near Loveland.

Reservoir to cover 1,500 acres completed; storage capacity 50,000 acre feet; enough for 30,000 acres; full amount of water available next spring.

Water Supply and Storage Company.

Irrigating 50,000 acres; large increase during 1908; brings water from one of the tributaries of the Grand river in a canal running at an elevation of 10,500 feet; water used in Poudre valley.

Standley Lake Project.

Enterprise fostered by Denver men, on which contracts have been let; to reclaim between 150,000 and 200,000 acres of land immediately west, north and east of Denver; Standley lake reservoir will hold 100,000 acre feet of water; company controls a dozen smaller storage basins and feeders; intended to bring water across the divide from two of the streams tributary to the Grand river and to the Eastern plains by way of South Boulder creek; work on this end of the project already under way; ultimate cost in the neighborhood of \$4,000,000.

Henrylyn Project.

Two irrigation districts already formed to use water enough to cover 115,000 acres adjacent to Denver on the west and northeast; main distributing canal to start near Riverside cemetery; water to be brought through divide from Williams Fork of the Grand; construction to begin this winter as capital already is available.

Fountain Valley Systems.

\$500,000 spent last season and the season preceding in the storage of waters of the Fountain river and of adjacent streams which run south into the Arkansas river; 10,000 acres put under water last summer for the first time; when the work now in progress is completed 50,000 acres will be reclaimed between Colorado Springs and Pueblo.

Penrose-Beaver System.

Practically completed last summer; most modern in the United States; pipes the water of Beaver creek to land near Canon City; 4,000 acres already sold in tracts of 10 acres each, planted in fruit; about 6,000 more in process of reclamation; all will be served by pipe systems. \$500,000 already spent.

Deweese System.

Extended last summer to cover 2,000 acres more; work still progressing; all land in vicinity of Canon City, where there are thousands of acres of fruit land and where land is worth \$1,000 an acre.

Dye Reservoir, North of Rocky Ford.

Completed; will make 15,000 acres of land fruitful next summer.

Granite Reservoir.

Completed in the mountains to supplement the Otero county canal, the big Rocky Ford system; will insure better production from 15,000 acres of land.

Arkansas-Eagle River Project.

Rivals Laramie-Poudre project in magnitude; is largely similar; will tunnel continental divide near Tennessee Pass, where Denver & Rio Grande railroad

crosses, gathering waters of the Eagle river, a stream as large as the Arkansas, will bring it to the lands of eastern Colorado; project will cost several million dollars; will irrigate more than 200,000 acres; considerable money spent in the preliminary work last summer.

Walsenburg Project.

To reclaim 20,000 acres near Walsenburg; waters of the Cucharas river will be stored in the mountains; work under way.

Huerfano Project.

Immense reservoir ten miles from the Canon of the Huerfano; 100,000 acre feet of water to be stored for the flat prairie ten miles southeast of Pueblo; enterprise started two years ago; some progress made last summer.

Bond-Purgatoire Project.

Considerable progress made in storing the waters of the Purgatoire river, which runs through Trinidad; 25,000 acres will be irrigated north of Trinidad.

Continental Reservoir, on Clear Creek.

Work in progress on a 100-foot dam; \$150,000 has been spent; 50,000 acres will be reclaimed.

Alamosa Dam.

Will store 100,000 acre feet of water, enough for 100,000 acres of pea land; dam is rapidly approaching completion.

Fort Garland Project.

New town started and 35,000 acres sold last summer by a company which is now constructing a system to irrigate the entire district; water will be available next spring.

Culebra Project.

Colorado Springs capital busy building dams and ditches to store the waters of the Culebra river and apply them to 35,000 acres of land.

Other Quasi-Public Projects.

In the western half of Montrose county are a number of projects, covering the largest single body of land on the western slope.

Wright's Mesa Ditch and Reservoir Company.

Canal building to reclaim 10,000 acres of land below Norwood.

Co-Operative Canal.

Takes water from San Miguel river; to enlarge ditch to carry 150 feet of water and irrigate 20,000 acres of land around Nucla.

Paradox Project.

To reclaim 15,000 acres of land in East Paradox; much work done last summer.

Lillylands Canal.

To reclaim 10,000 acres of land on Lillylands mesa; work proceeded on canal all summer.

Redlands Canal.

To take water from Naturita Creek and irrigate 10,000 acres of land on Wright's mesa; much money spent on same last summer; several miles of canal built.

Empire Project.

To use waters of Beaver creek; on Wright's mesa below Norwood; 20,000 acres to be reclaimed; work started last summer.

Grand Junction Project.

On the western slope the United States Government has begun throwing dirt on tremendous works which will reclaim the mesa north and west of Grand Junction. Eighty thousand acres have been surveyed as first class, most of it good for fruit. Inside of three years the project will be completed, as nothing except canals is necessary. The flow of the Grand river is so great that there never can be a shortage of water. The cost of the work has been estimated at \$2,000,000.

Other Projects.

In the Montezuma and Durango districts, the Montezuma irrigation district completed its tunnel to draw water from the Dolores river. Sixty thousand acres of land will be reclaimed next season; half of this was partly irrigated last season.

The Pinion Mesa Reservoir Company is projecting a 25,000 acre foot reservoir several miles east of Durango.

In Routt county the Little Snake river project will be able to deliver water next summer. Thirty-five thousand acres are to be reclaimed.

The rest of the projects are chiefly pumping. They are reclaiming about 40,000 acres. The most of them did considerable work last summer. Some were completed. On every side stream entering the Grand dirt was flying on small systems to reclaim the lower narrow shelves that follow the streams. The reclamation of the 120,000 acres of land on the Grand is equivalent to the reclamation of three times that area elsewhere because of the value of every acre for its production of fruit.

The Gunnison tunnel is expected to deliver water next summer. The headings rapidly are approaching each other. It seems a certainty that this main feature of the vast enterprise will be completed early in the year.

The water users have acceded to the request of the government to pay \$35 an acre instead of \$25.

The tunnel will admit Gunnison river water to the Uncompahgre valley, where 200,000 acres are available. One hundred and fifty acres will be added to the area now under cultivation.

Idaho

Minidoka Project.

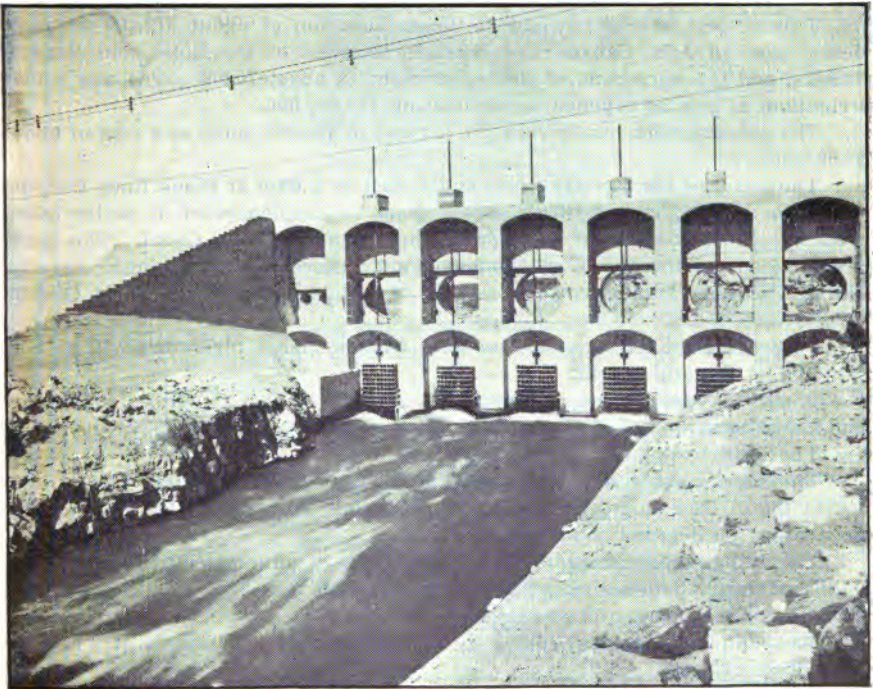
(Write Commercial Club of Burley, Rupert or Heyburn, Idaho; State Land Board, Boise, Idaho; or Project Engineer, Rupert, Idaho.)

About 130,000 acres of land situated on either side of the Snake River in Southern Idaho will be reclaimed by this project.

The Government has built a dam 85 feet wide and 700 feet long six miles south of Minidoka, at the outlet of Jackson's Lake, thus making a reservoir with a capacity of over half a million acre feet. Through 12,000 horsepower, generated by electricity, this water is to be pumped upon the irrigable area.

The soil is a deep, sandy loam free from alkali.

The farm unit is 40 and 80 acres, depending upon distance from the towns, no 80 acre units being located within $1\frac{1}{2}$ miles from the towns. There are some 160 acre units.



Dam in Diversion Channel: Minidoka Project.

The Government land available for entry has all been taken up.

Where the water right is on the gravity system, the cost is \$22.00 per acre in five or ten equal annual installments. There is a further maintenance charge of 60 cents per share. The cost of the water right on the division where water must be pumped has not been established.

The Oregon Short Line traverses the project, and vessel shipments may be made via the Snake River.

The temperature ranges from 20 deg. below zero to about 105 deg. above. Altitude 4200 feet.

Drinking water is reached by wells at from 30 to 150 feet.

Burley, Jackson, Rosston, Acequita, Rupert and Heyburn are the towns on the project.

Oats have yielded 120 bushels and wheat 81 bushels per acre. The ground promises well for sugar beets. All cereal crops may be raised.

The first unit of 80,000 acres is completed. Another section known as the Pumping Project will be completed early in 1909. This will irrigate 50,000 additional acres.

It is probable that the project will then be extended but no definite plans for these extensions have, at this writing, been completed.

The soil is sandy loam varying to volcanic ash.

Payette-Boise Project.

(Write Register, U. S. Land Office, Boise, Idaho; or Payette-Boise Water Users' Association, Caldwell, Idaho.)

This project has as its subject the reclamation of about 372,000 acres of desert land of Ada, Canyon and Owyhee counties in the Boise and Payette valleys, and the perfection of the water right to about 70,000 acres now under irrigation, at a total expense approximating \$11,000,000.

The present work has in view the serving of 100,000 acres at a cost of about \$3,000,000.

The water of the Payette River is diverted by a dam at Black Rock Canyon, five miles above Emmett. This supply is to be supplemented by water taken from the Boise River near the line of the Farmers' Union Canal. The lands are adjacent to the towns of Emmett, Falk's Store, New Plymouth, Payette, Notus, Caldwell, Middleton and Star, all of which, except Star, are in Canyon County.

To provide against the effect of long droughts large reservoirs will be constructed at Payette Lakes.

Work was commenced in 1906 and it is believed that it will be sufficiently completed to serve a large area of the land embraced early in 1909.

The altitude is from 2100 to 2800 feet.

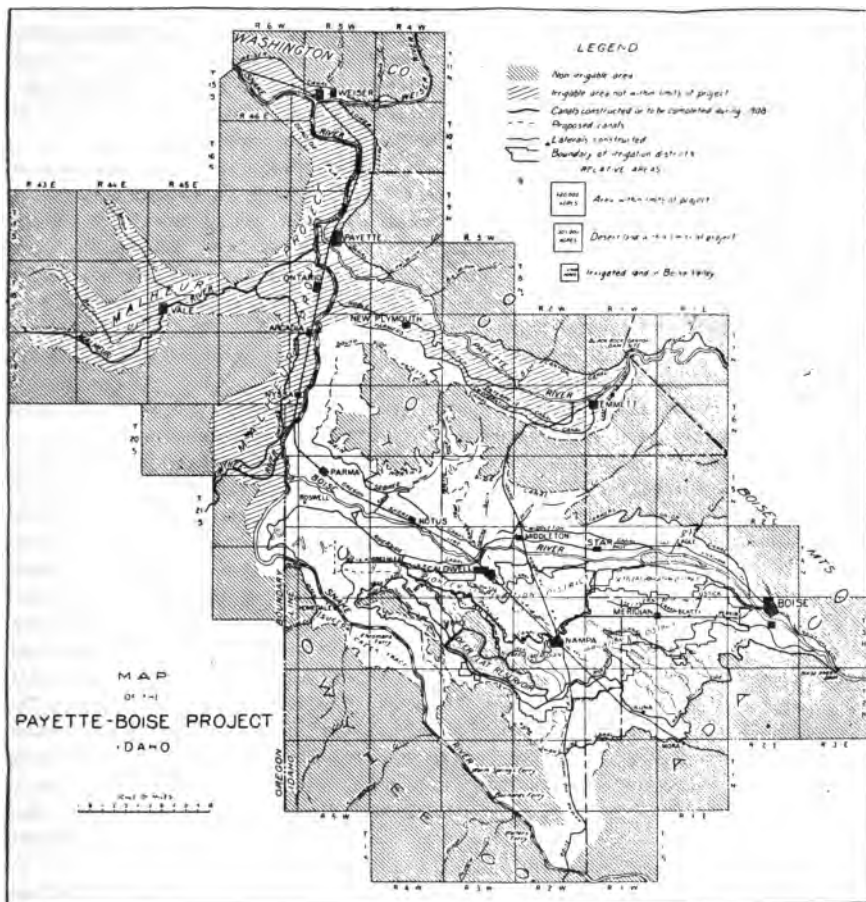
The thermometer sometimes reaches zero in winter but there are no high winds then. The summers are long and warm. Sometimes the thermometer goes over 100 degrees.

The soil is volcanic and rich in the necessary mineral constituents.

Good farms produce about two tons of alfalfa per acre each cutting, and three crops may be grown annually.

The land will produce from 4 to 6 tons of clover, 50 bushels of wheat or 75 bushels of oats.

All deciduous fruits and berries produce abundantly and are marketed in the east. A sugar beet factory and several creameries are in operation.



The farm-unit is 80 acres.

Nearly all of the land has been filed on, but the relinquishments may be purchased at from \$200 to \$2500 for 80-acre tracts. Deeded lands cost from \$50 per acre upwards.

Water rights cost about \$30 per acre, payable in ten annual installments, without interest. The maintenance charge for the gravity system is 40 cents per acre.

One must have paid his water assessments, and have lived on the land for five years before he receives title to same.

These lands are reached by the Oregon Short Line.

Boise, Meridan and Nampa are also on this project.

CAREY ACT PROJECTS.

Idaho.

The act of Congress known as the Carey Act was passed August 18th, 1894, and provided in substance that there should be granted to the States in the arid country one million acres of land to each State providing the State should

cause the same to be irrigated, reclaimed and occupied within ten years after the passage of the act. This ten year limitation which the first act of Congress contained was a serious drawback to irrigation development. The plan was new and investments in irrigation enterprises had generally been unprofitable, the States generally had not enacted suitable legislation to put the act in force and its purpose was not thoroughly understood.

In June, 1896, a very vital feature was added which provided that a lien might be created on the land by the State for the expense of reclamation. This was a most important feature of the law since it gave the security which, up to that time, had not been given to the investor. The ten-year limitation, however, still remained. This limitation was removed in March, 1901, so as to provide a period of ten years time upon each project. This period of time was generally considered amply adequate and from this date these acts, which together are generally called the "Carey Act," have been a most effective agent in the upbuilding of the State.

The legislature of the State of Idaho, in 1895, provided for the acceptance of the Act of Congress and passed a law providing that persons desiring to build irrigation works under the provisions of this law should present their proposal to the State Board of Land Commissioners describing the character of the works to be built, stating the nature of the water rights and of the water supply and specifying the price and terms at which water rights are to be paid. Under this law, this application is referred for examination to the State Engineer, whose duty it is to report upon the water supply, water rights, the character of the land and the feasibility of the project generally. After the making of the report by the State Engineer, the State Board of Land Commissioners either reject or accept the application, and in case of acceptance, they appoint a State agent to select and segregate the land. The various papers required by the regulations are forwarded to the Department of the Interior and when approved, a contract is entered into between the State and the United States providing for the conveyance of the land to the State when an ample supply of water is actually furnished in a substantial ditch or canal to reclaim the land. A patent is issued to the State, when the works are constructed, without regard to settlement of the land.

When work is actually commenced and the State Land Board is satisfied as to the soundness of the project, the land under the State law is thrown open for entry. No settlement, however, is required at this time. When the water is ready for delivery, it is the duty of the canal company to give notice to that effect and under the law, within six months thereafter, the entryman must take up his residence on the land and continue to reside there until he has made his final proof. This he may do in any time from five weeks to three years, depending upon the time spent by him in reclaiming his land. In order to prove up, he must cultivate and reclaim one-eighth of each legal subdivision before final proof can be made.

Twin Falls Land and Water Company.

The largest and most important contract made in any State under the provisions of the Carey Act was the contract of January, 1903, made with the Twin Falls Land and Water Company for the irrigation and reclamation of 270,000 acres of land situated in what was then Cassia and Lincoln counties. This project covered a magnificent body of land, the early reclamation of which had been prevented by reason of difficult engineering features, enormous.

cost and inadequate security to the investor as well as distance from transportation. For many years prior to this time, Mr. I. B. Perrine, whose Blue Lake ranch is one of the beauty spots of the State, had devoted his energies to the up-building of this project, but he was not successful until the Carey Act with its amendments had been finally adopted. The Twin Falls Land and Water Company, of which Mr. Perrine was the original promoter, was taken over by Mr. F. H. Buhl of Sharon, Pennsylvania, Peter Kimberly of Chicago, Illinois, and S. B. Milner of Salt Lake City, Utah. The contract with this company provided for the construction of a dam in Snake River approximately two thousand feet long and eighty feet in height which should raise the level of the river fifty feet. Water was to be diverted on the south side of the river, in what was then Cassia county, by means of a canal eighty feet wide on the bottom, one hundred and twenty-four feet wide on the top, constructed to carry a depth of ten feet of water and having a length of approximately eighty miles. On the north side of the river, water was to be diverted in a smaller canal for the irrigation of thirty thousand acres of land lying in Lincoln county. Construction work was commenced on the dam in the spring of 1903. On March 1st, 1905, the construction of the dam was completed, the gates were raised, and water was turned into the first section of the canal covering fifty thousand acres. Construction work was prosecuted vigorously and the canal system on the south side of the river was finally completed in the fall of 1907. The main canal is now eighty-three miles long and the approximate total length of all of the canals on the tract, including natural channels and farmers' distributaries, is one thousand miles. The area covered is two hundred and fifteen thousand acres. Water was first delivered for use under this canal system in the spring of 1905. One hundred and eighty-seven thousand acres under the canal have been settled upon and at the present rate of settlement, the remainder will probably be taken within the next twelve months. During the present year, 1908, approximately ninety thousand acres are in cultivation under this system and the remainder is being improved as rapidly as the resources of the settlers will permit. Under the law the required amount in cultivation on this tract, in order to make final proof, would be less than twenty-five thousand acres so that the cultivation actually done is nearly four times as great as required by law.

In the beginning, the average size of farms on this tract was one hundred and twenty acres. It is now less than eighty acres, showing the tendency of irrigated tracts toward small farms and intensive cultivation.

Notwithstanding the large number of water users, nearly twenty-four hundred in all, whose water contracts aggregate four and one-half million dollars, no judgment of foreclosure has been rendered in any case and the advanced payments made have exceeded the defaults. Water rights under this system were sold at \$25.00 per acre, a cash payment of \$3.00 being required, the balance being paid in nine annual installments with interest at six per cent.

Under the plan provided by the law, the works are purchased by the settlers at the price per acre above specified and are finally turned over to an operating company composed of the settlers, for management and control. This is the plan adopted on all projects in this State.

In addition to building irrigation works, the company established towns and some of those associated with it built telephone lines, water works and electric power plants.

The land under this canal, together with the section of Cassia county ad-

joining on the south, was in 1907 established as a separate county and named Twin Falls county. The town of Twin Falls, the county seat, in 1904, had less than 400 people. The estimated present population (1908) is 4000. It has two school houses, one costing \$35,000, the other \$54,000. It has besides this, the usual complement of churches and other public buildings as well as an electric light and telephone system, a water works system and a sewerage system costing \$100,000.

Twin Falls North Side Canal

The first plans contemplated that a canal should be taken out at the Milner dam for the irrigation of thirty thousand acres of land on the north side of Snake River in Lincoln county. Further surveys indicated that this amount might be very greatly increased at a very much larger cost, however.

In the spring of 1907, the Twin Falls North Side Land and Water Company, consisting of James S. Kuhn, W. S. Kuhn, J. H. Purdy, I. B. Perrine, H. L. Hollister and their associates, purchased the rights of the Twin Falls Land and Water Company for the irrigation of this tract of 30,000 acres and entered into a contract with the State of Idaho for the extension of the canal so as to cover in the aggregate 185,000 acres of land in Lincoln county. Work was immediately commenced upon the main canal which had a width of sixty feet on the bottom, one hundred and ten feet at the top and whose total length approximated 65 miles. The first section of this canal, covering what is known as the first segregation of 30,000 acres of land, was completed in the spring of 1908, and water delivered to the settlers on that tract. The remainder of the canal system will be completed by the spring of 1909, and water will be delivered to settlers on approximately 125,000 acres of land on what is known as the second segregation.

This company filed its proposal with the State in June, 1908, for an extension of its canal beyond what is known as the first segregation to cover an additional area of 50,000 acres. The extension would make the total length of the canal 100 miles and the total area under it 235,000 acres.

In addition to building the irrigation works, this company has arranged for the construction of 60 miles of railroad through this tract from the town of Gooding to the town of Milner. It has established the towns of Milner, Hillside, Jerome and Wendell and is constructing hotels, water works and electric light plants in these towns and is extending a telephone system to cover the greater portion of the tract. In fact, it may be said that the company takes the desert, builds irrigation works and completely furnishes the country with all of the modern comforts required by civilization. It has also advanced funds for the building of school houses so that schools will be ready immediately upon the taking up of their residence by the settlers. This method condenses within three or four years the progress which, under ordinary circumstances, requires twenty years with the result that the water rights sold to settlers are greatly enhanced in value to the great advantage of the settler, the towns become prosperous and the progress of the entire tract is very rapid. This method also very largely increases the taxable property of the county and State because titles are acquired as rapidly as possible by the settlers and extensive improvements are promptly made.

Salmon River Project.

The same organization under the name of the Twin Falls Salmon River Land and Water Company entered into a contract with the State in April,

1908, for the reclamation of approximately one hundred thousand acres of land in Twin Falls county south of the project of the Twin Falls Land and Water Company. Construction work was commenced and the land thrown open for settlement. Seventy thousand acres were entered within three days after the opening. The contract calls for the construction of a dam in the Salmon Falls River in Township 14 S., Range 15 E., to have a height of two hundred and ten feet and a length of five hundred and fifty feet. This dam is to be constructed very largely of concrete upon plans adopted by the company after careful investigation and approval by the State Engineer. A reservoir with a capacity of one hundred and eighty thousand acre feet will be created by the building of the dam. The reservoir will be fifteen miles long and of irregular shape. The main canal will be thirty miles long. It will be thirty-five feet wide on the bottom, sixty feet wide on top and carry eighty feet of water.

Oakley Project.

The same organization has caused application to be made to the State for the segregation of 45,000 acres of land between the towns of Milner, Oakley and Burley in Cassia county. The application has been approved by the State Board of Land Commissioners and a contract will probably be made with the State during the latter part of this year (1908). The work called for on this project is the building of a dam one hundred and thirty-five feet high, south of the town of Oakley and the storing of sixty-five thousand acre-feet of water.

South Side Pumping Plant.

The Twin Falls Land and Water Company has made a proposal to the State, which has been accepted, for the irrigation of 32,000 acres of land in connection with the South Side project. It is planned to irrigate the land by means of pumps utilizing for power a fall of seventy feet in one of the canals of the Twin Falls Land and Water Company.

North Side Pumping Plant.

The Twin Falls North Side Land and Water Company has made a proposal to the State, which has been accepted, for the irrigation of fourteen thousand acres of land in the vicinity of the town of Milner, the power for which is to be furnished from a drop in the main canal.

West Extension of Twin Falls Canal.

The most extensive development as yet proposed under the Carey Act is the building of an extension to the canal of the Twin Falls Land and Water Company heretofore referred to. The present canal is eighty-three miles long. It is proposed to extend this westward across Salmon Falls River so as to make the total length of the canal approximately one hundred and forty miles. This would require the enlargement of the canal to probably more than double its capacity, calling for a width of two hundred feet or more at the water line. It is proposed to irrigate 570,000 acres of land west of the Salmon River in Twin Falls and Owyhee counties. The water supply will be supplemented by nine reservoirs located upon the tract having a capacity of four hundred and fifty thousand acre feet and also by reservoirs on the head waters of Snake River. The entire country developed by these irrigation systems, which cover what is generally known as the Twin Falls country, will be as follows:

The Twin Falls Country.

| Project | Area (acres) |
|--|------------------|
| Twin Falls Land and Water Company | 215,000 |
| Twin Falls North Side Land and Water Company | 235,000 |
| Twin Falls Salmon River Land and Water Company | 100,000 |
| South Side Pumping Plant | 32,000 |
| North Side Pumping Plant | 14,000 |
| Twin Falls Oakley Project | 45,000 |
| Twin Falls Land and Water Company's west extension | 700,000 |
| Total | 1,341,000 |

The Twin Falls Land and Water Company's project as fully constructed covers two hundred and fifteen thousand acres. The project of the Twin Falls North Side Land and Water Company now covers thirty thousand acres and will cover in the spring of 1909, 125,000 acres. The project of the Twin Falls Salmon River Land and Water Company will cover 100,000 acres in the spring of 1909. The pumping plants, the Twin Falls Oakley project and the west extension of the Twin Falls Land and Water Company will follow later, but all of them will be completed on or before 1913.

American Falls Canal and Power Company.

One of the first segregations made in the State of Idaho under the Carey Act was that of the American Falls Canal and Power Company, embracing 57,000 acres of choice land lying on the west side of Snake River, between the towns of Blackfoot and American Falls, in a comparatively level valley sixty miles long and from six to eight miles wide, sloping to the southeast and draining into the Snake River. The soil is exceptionally rich and productive. The altitude about the same as Salt Lake City, Utah, 4400 feet, the latitude that of Spain and Italy. The best of water for domestic and culinary purposes is obtained from wells at a depth of from thirty to sixty feet, which rapidly fill with water to a depth of from fifteen to twenty feet. The sun shines nearly every day in the year and the climate is ideal for agricultural and horticultural purposes.

In 1895 the American Falls Canal and Power Company appropriated 1250 cubic feet of water per second from the Snake River, has spent nearly a million dollars on its canals and ditches, and is now irrigating lands under the three openings embraced in the segregation, the main canal, 85 feet wide at the top and 70 feet at the bottom, with a carrying capacity of six feet of water, having been completed for a distance of seventy miles, and the low line approximately twenty-five miles, with numerous branches and laterals, the canal narrowing in width and capacity as the various branches are taken out. On the entire canal there is but twelve feet of wooden flume, the balance being earth and stone construction, bringing 80,000 acres of land under irrigation, of which there remains unsold some 15,000 acres of Carey land.

Lands are purchased from the State at fifty cents per acre, one-half cash and balance when proof is made. Water right is sold at fifteen dollars per acre in the first opening, twenty dollars per acre in the second, and twenty-five dollars per acre in the third, on easy terms, three dollars per acre cash, two dollars per acre at the end of the second year and the balance in eight equal annual installments, deferred payments bearing interest at the rate of 6 per

cent. per annum. Payments other than above may be applied on principal at any time and interest stop on any payments so made. Many settlers have already made proof on their lands and approximately 20,000 acres were cultivated in 1908. At least 150 permanent dwellings, some of them attractive modern brick structures, have been erected and are occupied by an intelligent, industrious class of farmers from the middle west. School districts have been formed and steps taken for the erection of school buildings and churches. A number of orchards have been planted and large crops of grain and vegetables are being harvested, wheat running as high as 40 bushels to the acre, oats from 60 to 90 bushels, weighing 46 pounds to the bushel. Potatoes, onions and garden truck of exceptionally fine quality and large yield per acre. Alfalfa and other tame grasses are being sown and within a comparatively short time the entire valley will be covered with highly cultivated and improved farms.

A railroad, running from the main line of the Oregon Short Line Railway at American Falls through this tract to Blackfoot, has been surveyed and townsites established at Aberdeen and Springfield with daily mail service.

Anyone desiring further information concerning these lands may obtain same by addressing the American Falls Canal and Power Company at Aberdeen, Bingham County, Idaho.

The Marysville Canal and Improvement Company.

In 1906 the Marysville Canal and Improvement Company, Limited, engaged in the segregation and reclamation of certain lands lying in townships 8 and 9, ranges 42, 43 and 44 east of Boise Meridian, in Fremont county, eastern Idaho. This project will be completed next season. The main canal is about fifteen miles long and has a capacity of 264 thousand feet and serves a tract ten to thirteen miles in length and from three to five miles in width. The water supply is abundant, the appropriation exceeding the amount needed for all lands in the segregation. The source of supply is Fall River, a tributary of Snake River, and gives a never failing flow throughout the entire season. Five-eighths of an inch of water is allowed for each acre. This is sufficient to put water over each acre of land in forty days to a depth of one foot.

Ashton is the principal town on the tract and is an excellent business point. It has a population of 750 and all lines of business are represented. While only three years old it has some first class buildings which in general are exceedingly well built. The public schools are very good. Marysville is the pioneer town of this section and is one and one-half miles from Ashton. St. Anthony, about fifteen miles to the southwest, is the county seat. The Oregon Short Line branch to the Yellowstone Park traverses the center of the district.

The soil is of most excellent quality and is particularly valuable for the raising of grains and sugar beets. The land is splendidly adapted to irrigation and holds moisture well. On a conservative basis the average yields per acre on the entire tract are as follows: Wheat, 35 to 50 bushels; oats, 50 to 75 bushels; barley, 40 to 75 bushels; alfalfa, 3 to 5 tons; timothy, 3 to 4 tons; sugar beets, 10 to 20 tons. Yields doubling these amounts are sometimes harvested.

The lands, as in all cases under the Carey Act, are sold by the State at fifty cents per acre, twenty-five cents per acre when entry is made and twenty-five cents at the time final proof is submitted. The price for water rights is \$20 per acre, on the following terms: \$2.50 per acre on entry and the balance in nine

annual installments, with interest at six per cent. per annum on deferred payments.

Mr. W. M. Wayman, secretary of the company, whose address is Boise, Idaho, will answer inquiries regarding the project.

The Idaho Irrigation Company.

The Idaho Irrigation Company is developing a large project along the Oregon Short Line railroad in Blaine and Lincoln counties. The lands to be irrigated under this enterprise lie in the above named counties in the vicinity of Big and Little Wood Rivers and comprise about 110,000 acres of public lands segregated under the Carey Act.

Other lands in private ownership under the system aggregate about 15,000 acres. In addition, the company has recently applied for a further segregation. This application was duly approved by the State Land Board and sent to Washington for the approval of the Secretary of the Interior. This additional segregation asked for will bring the total to about 160,000 acres.

The lands are located near the main line of the Oregon Short Line and along the Ketchum branch of that road, near Shoshone and around Gooding, these roads passing through the tract. The lands lie north of and are of the same general character as the Twin Falls tract which was opened in 1905 and which has proved such a pronounced success, and it is not too much to add that the success of the Twin Falls project has given great impetus to all other Carey Act projects in the State. The soil is of very good quality for agricultural purposes and consists of a deep, finely divided, dark brown loam. The general slope of the surface is such as to facilitate the process of irrigation. The climatic conditions are very good for plant life and, under irrigation, will produce excellent crops of alfalfa, sugar beets, wheat, barley, oats, potatoes, apples, plums, pears and other fruits. In other words, practically all cereals, tubers and fruits indigenous to the temperate zone can be raised; the yield being much larger than is found in the eastern States where irrigation is not practiced.

The average yields per acre are about as follows: Potatoes, 300 bushels; beets, 20 tons; alfalfa, 6 to 8 tons; oats, 75 to 85 bushels; wheat, 50 to 65 bushels.

The waters for the irrigation of these lands will be obtained from Big and Little Wood Rivers, important tributaries to the Snake. During the latter part of the season the natural flow of these streams will be supplemented by waters impounded in a reservoir to be constructed by the company. The reservoir site is extremely good and will impound sufficient water to provide against all needs in the irrigation of at least 160,000 acres. The company has taken all necessary steps looking to the appropriation of waters and the perfection of the necessary legal title thereto, the general plans of the proposed system having been submitted to the State Engineer and having obtained his approval. These plans contemplate the construction of an impounding dam together with diversion dams, canals and laterals for the irrigation of about 125,000 acres. These works can be increased to furnish water for 160,000 acres. The necessary expenditure for this additional construction will be reasonably small.

Payment for water rights is made in ten annual installments which amount to \$35 per acre, with interest at six per cent. on all deferred payments. Interest begins to accrue when water is delivered to the land. The second annual payment is not due until water has been delivered over the entire section. Water

will be available for 50,000 acres in 1909 and the remainder of the water will be supplied one year later.

Inquiries to be addressed to the Idaho Irrigation Company, Richfield, Idaho.

Portneuf-Marsh Valley Irrigation Company.

The Portneuf-Marsh Valley Irrigation Company is proceeding to reclaim about 20,000 acres of land near the town of Downey, in Bannock county, about 40 miles southeast of Pocatello. Twelve thousand acres of this land have been segregated under the provisions of the Carey Act and the remainder is private land and government land still open to entry.

The plans of the company for the reclamation of this tract include the construction of a reservoir to impound the waters of the Portneuf River in the vicinity of Chesterfield on the upper Portneuf and the diversion of the water at a point near Downey. About fifty miles of canals and laterals will constitute the distributing system. The tract of land to be irrigated lies within six miles of the Oregon Short Line railroad. It lies in a succession of rolling benches and constitutes one of the most beautiful and fertile areas in the State.

On September 7, 1908, the State Land Board threw open to entry the Carey Act lands under this project and within a few days practically one-half of the land had been entered. The price of water rights is \$35 per acre, the terms being \$3 cash at the time of entry and the remainder in nine equal annual installments, with interest at six per cent. on deferred payments.

Owing to the choice character of the land and the great demand for it, the Land Board, at the request of the irrigation company, decided to restrict entries on this tract to eighty acres each. The soil is a mixture of exceptionally fertile volcanic ash and loam many feet in depth and entirely free from any rock or lava out-croppings.

This tract of land will doubtless prove to be one of the finest areas in the State, being especially adapted to grain, hay, sugar beets and the hardier fruits. Those interested may address Mr. E. C. Crocker, Downey, Idaho.

The Kings Hill Irrigation and Power Company.

On May 1st, 1908, a contract was entered into between the State Board of Land Commissioners, on behalf of the State of Idaho, and the Kings Hill Irrigation and Power Company, the company agreeing to construct and complete, within three years, the irrigation project previously undertaken by the Glenss Ferry Land and Irrigation Company.

The Kings Hill Irrigation and Power Company purchased and took over the segregation and all the assets of the old company and immediately commenced pushing the work of construction vigorously.

The segregation covers about 14,000 acres of very fertile land lying in a cove, surrounded by high bluffs along the south side of Snake river and extending from Glenss Ferry to a point opposite Bliss, being tributary to the towns of Glenss Ferry, Bliss and King Hill, which are all on the main line of the railroad along the river.

The principal office of the company is at Boise and the headquarters for the land business are at the new town of King Hill, which this company has laid out.

The State Board of Land Commissioners granted a "land opening" to be held at King Hill, October 12th, 1908, at which time at least two-thirds of the construction was completed, and such plans have been laid and contracts let

as will guarantee the entire completion and delivery of the water by April 1st, 1909.

On account of the great cost of irrigation per acre and the high grade of the soil (it being mostly fitted for fruit and high-class farming) the State Land Board fixed a price of \$65 per acre to be paid in ten equal payments.

An ample supply of water for the irrigation of these lands will be obtained from the Malad river, the company having obtained legal title to the use of the waters of that stream in an amount sufficient to meet all needs. An excellent dam is being built across Malad river about one mile from Snake river. Three hundred second feet will be carried across Snake river in a six-foot inverted syphon pipe, resting on a steel truss bridge 300 feet long.

The canal for the first 20 miles will have a capacity to carry enough water to irrigate more than 20,000 acres, besides supplying the towns of King Hill, Glenns Ferry and the lands tributary on the north side of the Snake river. This company is building a telephone line along its construction and to the townsite of King Hill, to which the greater part of the segregated lands are tributary, and this telephone line will be turned over to the settlers as a part of the project, who can then operate it along with the maintenance of the ditch. It has constructed a ferry, with boat, opposite Bliss and one at King Hill, besides providing a ferry between the two places named. Glenns Ferry is already equipped with two ferries, thus giving ample facilities for the conveyance of settlers to the railroad points lying along and adjacent to the segregated lands.

All of the material used in the construction of the flumes and bridges is of the best of Oregon fir and is being put in in the most durable and lasting manner.

It is the purpose and plan of this company to have a continuous supply of water throughout the entire year.

Canyon Canal.

The Canyon Canal covers about 20,000 acres on the Emmett bench, north of the Payette river, opposite the town of Emmett, and about 3500 on the south side of the river, surrounding Emmett, this land being the upper end of the famous Payette valley. Water is diverted from the Payette river at a point about 18 miles up the river from Emmett and about four miles from Marsh. The water is raised about ten feet by means of a timber crib and rock dam across the river, is diverted through two 14-foot segmental headgates that are built in solid rock, and is carried through a main canal that is 20 feet wide on the bottom at its head, with a water depth of five feet. This canal has a total length of almost 33 miles. The first 14 miles is through the canyon of the Payette river, requiring three tunnels and quite a little fluming, with no land susceptible of irrigation under it, after which the canyon opens out, forming a tract of exceptionally fine fruit land about 17 miles long by three miles wide, known as the "Emmett Bench." At the head of this bench a branch canal is carried across the river by means of a suspension bridge and inverted syphon, delivering water to about 3500 acres east and south of Emmett. The capacity of the main canal is 300 second feet and of the south side branch about 50 second feet.

The water supply is abundant, being taken from the Payette river, one of the steadiest streams as to normal flow in the State. The company has taken necessary steps leading to the perfecting of title to the use of necessary waters.

The first season of water is just closing and has been very successful, both

for the entrymen and the canal company. Lands have increased in value from \$10.00 to \$100.00 per acre, in some instances, and this without the water, making \$130.00 with the water, which is payable in ten annual installments of \$3.00. A number of Grand Valley, Colorado, fruit growers have purchased lands under this canal system and are getting ready to plant trees in the Fall and Spring. The lands on the Emmett Bench are regarded by them as being ideal for winter apples, while the farms surrounding the town of Emmett, on the south side of the river, are noted for the excellence of their peaches and, in fact, all fruits.

The principal town of this tract is Emmett, with a population of about 2300. Emmett is the terminus of the Idaho Northern Railway, which connects with the main line of the Oregon Short Line Railway at Nampa, 30 miles distant, and is a wide awake, thriving and modern little city, well represented in all lines of business and the professions, with excellent school systems, churches and public improvements.

Water is sold for \$30.00 per share of $\frac{1}{8}$ inch, which is the amount furnished each acre, and is dedicated and made appurtenant to particular lands and forever applies to those lands and no other. There are no maintenance charges to be paid by the entrymen until such time as they take over the system.

The Big Lost River Land and Irrigation Company.

A tract of about 81,000 acres, located on the western side of the Snake River valley, at the intersection of Blaine, Bingham and Fremont counties, has been segregated to the State to be reclaimed by the Big Lost River Land and Irrigation Company. The Snake river branch of the Oregon Short Line Railway passes directly through this land with terminus at May, in the Lost river valley. This valley forms a gateway into the center of the great mountain ranges of central and northern Idaho, which contain, in a more or less undeveloped state, all the minerals produced in the United States. This region will furnish a good market for the surplus products of the soil raised upon the Big Lost River tracts.

Although this section has acquired a reputation as a winter wheat country, yet it is capable of diversified farming. Wheat, oats, barley, clover, timothy, flax, alfalfa, sugar beets and potatoes make excellent yields. Excellent apples, prunes, pears and small fruits are grown. The most profitable crop in this section is that of sugar beets, the land being especially adapted to that industry. Twenty tons per acre is not an uncommon yield and the crop is marketed at the beet sugar factory at Blackfoot at \$4.50 per ton. Alfalfa sells for \$4 to \$8 per ton in the stack, timothy for \$10 to \$12 per ton, potatoes at \$1.50 to \$4 per hundred pounds. The prices of other farm commodities compare favorably with the prices quoted above.

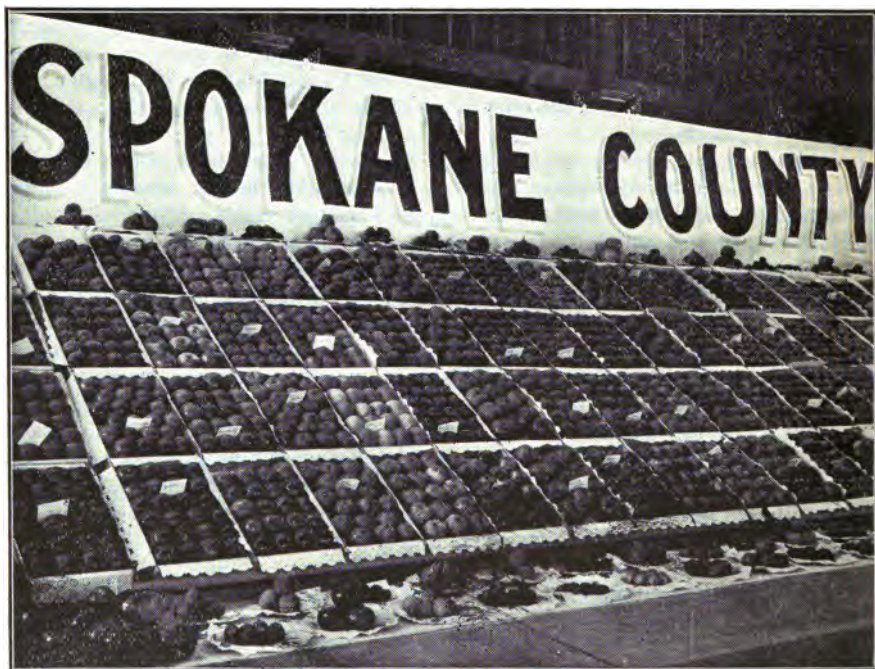
The terms upon which water rights are sold are as follows: \$25.50 and \$30.50 per acre, according to selection, \$3.25 per acre at time contract is entered into with the company, the balance to be paid in ten annual installments, six per cent. interest being charged on deferred payments.

Other Enterprises.

Several other similar projects are being developed under the Carey Act. These are as follows: The Pratt Irrigation Company is proceeding to reclaim 4500 acres in Oneida county; The Owyhee Irrigation Company, 3200 acres in Owyhee county; the Houston Ditch Company, 1800 acres in Custer county; the



Alfalfa at Yuma. Fourth Crop Ready to Cut.



Yakima Project Apples.

Grandview-Snake River Irrigation Company, 4500 acres in Ada county, and the Owyhee Land and Irrigation Company, 30,000 acres in Owyhee county. The Twin Falls West End Irrigation Company also proposes to reclaim about 50,000 acres to the west and south of the Twin Falls system in the southwestern portion of Twin Falls county.

Twin Falls Projects.

(Write Twin Falls Land and Water Co., Twin Falls, Idaho.)

In Twin Falls County, which is one of the most southern of Idaho Counties, having been recently made by dividing the greater Lincoln into three counties, there are allied syndical companies engaged in irrigating adjoining areas.

The Twin Falls Land and Water Company treat their land as two different projects, distinguishing them by calling them the North Side System and the South Side System as they lie to the north and south of the Snake River near where the waters of the Salmon River flow into it.

The conditions opposite these two projects, treated separately, are as follows:

Twin Falls Land and Water Company, Milner, Idaho.

North Side System.

Area to be reclaimed: 180,000 acres.

Estimated cost: \$4,500,000.

Cost of work to Jan., 1908: \$800,000.

Per cent. of work uncompleted: 75%.

Soil: Sandy loam and volcanic ash.

Cost of land: Taken under Carey Act cost \$30 to \$35 per acre.

Residence required: 30 days to 2 years.

Cost of water stock per acre: \$30 to \$35.

Maintenance charge per acre per year: 20 to 80 cents.

Farm Unit: 40, 80, 120 and 160 acres.

Altitude: 2900 to 4100 feet.

Temperature: 3 deg. below zero to 110 above.

Annual rainfall: 12 inches.

Products: Grain, hay, fruits and vegetables.

Railroads: Oregon Short Line.

Towns: Jerome, Wendell, Gooding and Milner.

Will be completed in March, 1909.

Twin Falls Land and Water Company, Twin Falls, Idaho.

South Side System.

Area to be reclaimed: 230,000 acres.

Cost of system: \$4,000,000.

Completed Jan. 1st, 1908.

Soil: Sandy loam and volcanic ash.

Cost of land: The State sells this land for 50 cents per acre, and the company sells the resident and water right at \$25 per acre.

Under ruling of the State Land Board, thirty days' residence with family is sufficient to make proof.

The annual maintenance charge is 80 cents per acre.

Farm unit limit: 160 acres.

Altitude: 3700 feet.

Annual rainfall: 12 inches.

Products: Grain, grasses, sugar beets, fruits, etc.

Railroads: Minidoka & Southwestern.

Principal towns: Twin Falls, Buhl, Filer, Kimberoy and Mortavon.

The same Company has under way the reclamation of between 500,000 and 700,000 acres of land adjoining the above project on the west. Surveys are now being made.

Full data as to this will be ready about March 1, 1909.

Twin Falls-Salmon River Land and Water Co.

Twin Falls, Idaho.

This tract adjoins the Twin Falls South Side lands and is to the south thereof.

Area to be reclaimed: 80,000 acres.

Estimated cost: \$2,000,000.

Cost of work to Oct. 1, 1908; \$400,000.

Per cent. of work uncompleted: 90%.

Soil: Sandy loam and volcanic ash.

Cost of land per acre: \$40.

Required residence: 30 days to 3 years.

Cost of water stock per acre: \$25.

Yearly maintenance charge: 35 cents per acre.

Farm unit limit: 160 acres.

Altitude: 4000 to 5000 feet.

Annual rainfall: 15 inches.

Temperature: 6 below to 102 above zero.

Products: Grain, fruits and stock.

Railroads: Oregon Short Line.

Nearest towns: Hollister, Twin Falls and Buhl.

When completed: 1910.

SEGREGATED LANDS.

The following statement shows the number of acres segregated under the provisions of the Carey Act under the various irrigation companies operating under said Act in the State of Idaho, together with a statement of the number of acres for which segregation has been asked and is now pending, and also the number of acres for which application has been made to the State, but for which segregation has not yet been requested, to wit:

Acres Segregated.

| | |
|---|------------|
| Twin Falls Land and Water Co. | 244,025.98 |
| Twin Falls North Side Land and Water Co. | 158,850.43 |
| Idaho Irrigation Company | 109,717.17 |
| Big Lost River Land and Irrigation Co. | 79,122.06 |
| Mullins Canal Co. | 6,528.05 |
| King Hill Irrigation and Power Co. | 17,666.72 |
| Canyon Canal Co. | 5,829.02 |
| Marysville Canal Co. | 6,572.50 |
| American Falls Canal and Power Co. | 57,241.90 |

Total acres segregated 685,553.83

Segregation Pending.

| | | |
|---|------------|------------|
| Portneuf Marsh Valley Irrigation Co. | 12,222.43 | |
| Pratt Irrigation Company | 4,516.49 | |
| Twin Falls Land and Water Co.'s Pumping Plant | 27,325.33 | |
| Salmon River Project | 140,000.00 | |
| Cedar Creek Reservoir and Irrigation Co. | 46,775.71 | |
| Owyhee Irrigation Company | 3,234.24 | |
| Total segregation pending | | 234,074.20 |

Segregation Requested of State.

| | | |
|--|-----------|------------|
| Grand Canyon Canal Co. | 9,375.00 | |
| Wm. Owsley project | 12,000.00 | |
| Total acres applied for but segregation not yet requested | | 21,375.00 |
| Total acres segregated, pending and applied for to the State | | 941,603.03 |

CAREY LAND FILED UPON.

The following statement shows the number of acres filed upon under the various companies operating under the provisions of the Carey Act in the State of Idaho, to wit:

| | |
|---|------------|
| Idaho Irrigation Company | 24,450.00 |
| Twin Falls Land and Water Co. | 164,423.24 |
| Canyon Canal Company | 5,830.16 |
| Mullins Canal Company | 720.00 |
| Marysville Canal Company | 5,941.83 |
| American Falls Canal and Power Co. | 36,317.24 |
| Big Lost River Land and Irrigation Co. | 8,310.83 |
| Twin Falls North Side Land and Water Co. | 78,204.93 |

Total acres filed upon under provisions of the Carey Act 324,198.23

PRICE OF WATER RIGHTS FOR CAREY LAND.

The following statement shows the maximum price for which water is sold for lands entered under the provisions of the Carey Act under the various Companies operating under said Act, and the proposed maximum price for which water is to be furnished by those companies which have made application to the state to have land segregated under this Act, to wit:

Companies Now Operating Under the Carey Act.

| | |
|--|---------------------|
| Twin Falls Land and Water Company | \$25 00 and \$30.00 |
| Twin Falls North Side Land and Water Company | 30.00 and 35.00 |
| Idaho Irrigation Company | 35.00 |
| Big Lost River Land and Irrigation Co. | 25.00 and 30.00 |
| Mullins Canal Company | 10.00 |
| King Hill Irrigation and Power Co. | 50.00 |
| Canyon Canal Company | 30.00 |
| Marysville Canal Company | 20.00 |
| American Falls Canal and Power Co. | 15.00 to 25.00 |

Companies proposing to operate under the provisions of the Carey Act, together with proposed price of water for lands thereunder, to wit:

| | |
|---|---------|
| Portneuf Marsh Valley Irrigation Company | \$35.00 |
| Pratt Irrigation Company | 28.00 |
| Twin Falls Land and Water Co.'s pumping plant | 40.00 |
| Salmon River project | 40.00 |
| Cedar Creek Reservoir and Irrigation Company | 35.00 |
| Owyhee Irrigation Company | 25.00 |
| Grand Canyon Canal Company | 30.00 |
| Wm. Owsley project | 25.00 |

LOCATIONS OF CAREY ACT PROJECTS.

The following statement shows the various counties in the State in which the different Companies operating under the Carey Act are located, and also the counties in which the proposed Companies intend to construct their works, to wit:

Twin Falls Land and Water Company, Twin Falls county.
Twin Falls North Side Land and Water Company, Lincoln county.
Idaho Irrigation Company, Blaine and Lincoln counties.
Big Lost River Land and Irrigation Company, Blaine and Bingham counties.
Mullins Canal Company, Lincoln county.
King Hill Irrigation and Power Company, Owyhee county.
Canyon Canal Company, Canyon county.
Marysville Canal Company, Fremont county.
American Falls Canal and Power Company, Bingham and Blaine counties.
Portneuf Marsh Valley Irrigation Company, Bannock county.
Pratt Irrigation Company, Oneida county.
Twin Falls Land and Water Company's pumping plant, Twin Falls county.
Salmon River project, Twin Falls county.
Cedar Creek Reservoir and Irrigation Company, Twin Falls and Owyhee counties.
Owyhee Irrigation Company, Owyhee county.
Grand Canyon Canal Company, Bingham county.
Wm. Owsley project, Fremont county.

Ada County.

Price of improved lands with perpetual water right, from \$75 to \$100 per acre; unimproved lands with perpetual water right, from \$50 to \$75 per acre; orchards, from \$300 to \$500 per acre.

Bannock County.

Improved lands cost from \$20 to \$40 per acre; unimproved, from \$10 to \$20, including water right.

Bear Lake County.

Improved lands cost from \$25 to \$50, unimproved from \$10 to \$20 per acre, including water right.

Bingham County.

Carey Act lands under the irrigation project of the American Falls Canal and Power Co., Blackfoot. Total acreage, 65,000; unsold and open to settlement, 15,000 acres; cost of perpetual water right, \$25; terms of payment, \$3 per acre cash, \$2 per acre at end of one year, balance in eight equal annual pay-

ments with 6 per cent. interest on deferred payments. Improved lands cost from \$50 to \$100; unimproved from \$25 to \$35 per acre, including water right.

Blaine County.

Blaine County Irrigation Co., Arco; Carey Act lands; 11,000 acres under project; acreage unsold and open to settlement, 8,000. Cost of perpetual water right, \$25 per acre; terms of payment, \$5 per acre cash down and balance in five equal annual payments.

Big Lost River Land and Irrigation Co., Ltd., office, Boise; Carey Act Lands: 80,000 acres under project; unsold and open to settlement, 60,000 acres. Cost of perpetual water right, \$30 per acre; terms of payment, \$3.25 cash, balance in ten equal annual installments with 6 per cent. interest.

Improved lands with water right cost from \$40 to \$70 an acre; unimproved, from \$10 to \$20 an acre.

Boise County.

Improved lands with perpetual water right cost from \$20 to \$50 per acre; unimproved from \$5 to \$15 per acre.

Bonner County.

Within the rain belt. Improved lands cost from \$15 to \$40 an acre. Unimproved government land may be taken under homestead, or under stone and timber act. These lands are principally all enclosed within forest reserves, but where such lands are agricultural they can be secured as homesteads.

Canyon County.

The New Plymouth Land and Colonization Co., of Payette, has a private project consisting of 50,000 acres, of which 10,000 acres are still open to purchase at \$40 per acre, including a perpetual water right. The terms of payment are \$5 per acre down and \$5 per acre annually thereafter until paid.

Improved lands cost from \$75 to \$100 per acre; unimproved, from \$25 to \$50 per acre, with an additional \$30 per acre for perpetual water right, payable in ten annual installments. These are practically all fruit lands. Orchards cost from \$350 to \$600 per acre.

Cassia County.

Improved lands cost from \$20 to \$50 per acre, with water right; unimproved lands from \$10 to \$15 per acre.

Custer County.

Improved lands from \$25 to \$50 in price, including water right; unimproved, from \$10 to \$20 with water right.

Elmore County.

Government lands may be had under the homestead or desert entry law under the private irrigation project of the Great Western Beet Sugar Co., Mountain Home. Perpetual water right costs \$35 an acre.

Improved lands with water right cost from \$50 to \$150 an acre.

Fremont County.

Under the Carey Act project of the Marysville Canal and Improvement Co., Ltd., Marysville, lands to the extent of 900 acres are still open to settlement. The total acreage of the project is 6,400. A perpetual water right costs \$20 per acre; 10 per cent. down and balance in nine annual installments.

Improved lands range in price from \$30 to \$125 per acre with perpetual water right; unimproved lands from \$15 to \$25 per acre with water right.

Idaho County.

Within rain belt. Improved lands cost from \$25 to \$100 per acre. Unimproved government land may be taken under timber and stone act at \$2.50 per acre. These lands are, however, practically all within the forest reserves, but where it is found that they are more valuable for agricultural than for timber purposes, they may be settled upon, under the homestead law.

Kootenai County.

Hayden Lake & Dalton Gardens Irrigated Lands, Coeur d' Alene City. There are 8,000 acres under this system, of which 4,000 acres are yet unsold. Cost per acre with perpetual water right is \$150 to \$250; sold in five-acre tracts for orchard purposes.

Most of the lands in this county receive sufficient rainfall to produce crops without irrigation. Improved lands sell for from \$25 to \$75 per acre; unimproved government land can be taken under the homestead or timber and stone act.

Latah County.

Within rain belt. Improved lands cost from \$50 to \$100 per acre. Unimproved government lands may be taken under the homestead or timber and stone act.

Lemhi County.

Improved lands with perpetual water right range in price from \$20 to \$50 an acre; unimproved, from \$5 to \$10 an acre.

Lincoln County.

A Carey Act project, known as the Idaho Irrigation Co., Alberta, covers 110,000 acres, of which 83,217 acres are yet unsold and open to settlement. Cost of perpetual water right is \$35 per acre; terms of payment, \$3 down, balance in nine annual installments with 6 per cent. interest on deferred payments.

The Twin Falls North Side Land and Water Co., Jerome, includes 180,000 acres, of which 30,000 acres are yet open to settlement. The cost of perpetual water right is \$35 per acre, payable in nine annual installments as follows: 1st, 2nd, 3rd and 4th payments, \$2 each per acre; 5th and 6th, \$4 each per acre; 7th and 8th, \$5 each per acre; 9th (the last) \$6 per acre. Interest on deferred

payments, beginning March 1st, 1909, 6 per cent. per annum.

Mullins Canal and Reservoir Co., office at Payette, is a Carey Act project covering 6,000 acres, 5,000 of which are yet unsold and open to settlement. Cost of perpetual water right is \$35 per acre, payable 10 per cent. annually until paid.

Improved lands with water right cost from \$30 to \$100 per acre; unimproved, from \$10 to \$30 per acre.

Nez Perce County.

Lewiston Sweet Water Irrigation Co., Lewiston, private enterprise. Total acreage under project 4,000, divided into five-acre tracts for orchard purposes. Cost of land with perpetual water right, \$350 per acre; terms of payment to suit purchaser. This is a perfect water works system under gravity pressure. Unsold, 1,000 acres.

The majority of lands in this county are within the rain belt. Improved lands cost from \$25 to \$100 per acre; unimproved government land may be taken under homestead or timber and stone act.

Oneida County.

Improved lands cost from \$25 to \$50 per acre with water right; unimproved, from \$8 to \$25 per acre.

Owyhee County.

Murphy Land & Irrigation Co., private enterprise with office at Boise, covers 10,000 acres, 5,000 acres of which are yet unsold and open to settlement. Lands are taken under the homestead or desert entry law. The water right costs \$50 per acre, payable one-tenth down, balance in nine equal annual installments.

Improved lands with perpetual water right cost from \$50 to \$75 per acre; unimproved, from \$5 to \$15 per acre.

Shoshone County.

Within rain belt. Improved lands cost from \$25 to \$50 per acre; unimproved government land may be had under the timber and stone act, or by homestead.

Twin Falls County.

Twin Falls Land and Water Co., Twin Falls. Acreage under project, 240,000; unsold and open to settlement, 10,000 acres; cost of perpetual water right, \$25 per acre, payable one-tenth down, balance in nine equal annual installments with 6 per cent. interest on deferred payments.

Improved lands cost from \$75 to \$100 per acre, including water right.

Washington County.

Improved lands with perpetual water right cost from \$50 to \$150 per acre; unimproved, from \$15 to \$25 per acre. Orchards from \$300 to \$600 per acre.

Fruits of all kinds, except the citrus family, including berries, melons, etc., etc., are grown to perfection in all counties of the State, except Bear Lake, Custer, Bingham, Fremont and Blaine; and all the hardier fruits, such as apples, pears, plums, prunes, cherries and berries do well in all counties.

Sugar beets containing a very high per cent. of saccharine matter are successfully grown in all parts of the State.

CLIMATOLOGICAL SCHEDULE

For the State of Idaho by Counties—1906

| Counties | Station | Elevation | Temperature | | Precipitation | | No. Rainy Days | No. Clear Days |
|------------------|----------------|-----------|-------------|------------|---------------|-------|----------------|----------------|
| | | | Above Zero | Below Zero | Rain | Snow | | |
| Ada | Boise | 2770 | 102 | 5 | 14.19 | 28.1 | 103 | 262 |
| Bannock | Chesterfield | 5424 | 94 | 31 | 21.05 | 67.0 | 73 | 292 |
| " | Pocatello | 4483 | 96 | 12 | 18.17 | 52.4 | 101 | 264 |
| Bear Lake | Paris | 5496 | 88 | 23 | 17.84 | 62.1 | 67 | 298 |
| Bingham | Blackfoot | 4503 | 99 | 24 | 14.81 | 48.0 | 56 | 309 |
| " | Idaho Falls | 4742 | 95 | 26 | 14.38 | 53.5 | 103 | 262 |
| Blaine | Lost River | 5700 | 91 | 19 | 15.74 | 89.1 | | |
| Boise | Lardo | 6500 | 93 | | 32.52 | | | |
| Canyon | Caldwell | 2372 | 104 | 6 | 13.24 | 37.3 | 83 | 332 |
| " | Poplars | 2425 | | | 13.23 | | | |
| Cassia | Milner | 4097 | 102 | 6 | 13.87 | 56.7 | 61 | 304 |
| " | Oakley | 4191 | 94 | 10 | 13.65 | 33.5 | | 206 |
| " | Standrod | | | | 18.42 | 82.8 | 89 | 276 |
| " | Twin Falls | 3825 | 101 | 8 | 11.71 | | 73 | 292 |
| Custer | No Sta. Given | | | | | | | |
| Elmore | Ellerslie | 3500 | 101 | 1 | 14.75 | | 80 | 275 |
| " | Garnet | 2575 | 108 | 7 | 8.20 | | 49 | 316 |
| Fremont | Lake | 6700 | 86 | 26 | 21.89 | 166.4 | 87 | |
| " | Vernon | | 95 | 23 | 22.24 | | 75 | |
| " | Salem | 5000 | | | 17.04 | | 89 | |
| Idaho | Pollock | 2050 | 105 | 3 | | | | |
| " | Roosevelt | 7250 | 85 | 15 | 25.86 | | | |
| Kootenai | Lakeview | 2250 | 97 | 1 | 27.60 | 62.0 | 89 | 276 |
| " | Porthill | 1665 | 96 | 5 | 19.39 | 87.0 | 105 | 260 |
| " | St. Maries | 2062 | 100 | 0 | 28.82 | 45.7 | 105 | 260 |
| Latah | Moscow | 2748 | 99 | 2 | 26.93 | | 124 | 241 |
| Lemhi | Forney | | 100 | 23 | 21.03 | 102.9 | 133 | 232 |
| " | Salmon | 4040 | 97 | 18 | 9.99 | 44.7 | 95 | 270 |
| Lincoln | Shoshone | 4260 | | | | | | |
| Nez Perce | Dent | 1767 | | | 32.86 | 52.4 | 119 | 246 |
| " | Lewiston | 757 | 107 | 7 | 14.43 | 11.5 | 100 | 265 |
| Oneida | American Falls | 4341 | 100 | 16 | 16.66 | | 60 | 305 |
| " | Weston | 4610 | 96 | 17 | | 43.0 | | |
| Owyhee | Hot Springs | 2572 | 104 | 3 | 9.38 | 20.5 | 71 | 294 |
| Shoshone | Kellogg | 2330 | 98 | 1 | 31.92 | 51.1 | 140 | 225 |
| " | Murray | 2750 | 97 | 7 | 34.62 | 99.0 | 135 | 230 |
| Washington | Landore | 5300 | 90 | 18 | 46.57 | 210.0 | 144 | 221 |
| " | Cambridge | 2750 | 107 | 13 | 22.33 | | 86 | |
| " | Meadows | 3750 | 104 | 16 | 21.97 | 94.4 | 96 | 269 |

IRRIGATION DATA, STATE OF IDAHO.

296 Companies.

| | |
|--|--------------|
| Capital invested | \$27,431,325 |
| Miles of main canals | 2,628 |
| Miles of lateral canals | 6,373 |
| Acres covered by canals | 2,869,896 |
| Acres under canals, cultivated | 996,570 |
| Acres under canals, uncultivated | 1,871,336 |

RECAPITULATION BY COUNTIES.

| | | | | | | |
|------------------------|------|-------|--------------|-----------|---------|-----------|
| Ada | 149 | 337 | \$1,230,500 | 203,360 | 63,145 | 140,215 |
| Bannock | 124 | 174 | 421,125 | 52,806 | 30,380 | 20,426 |
| Bear Lake | 95 | 209 | 170,550 | 38,640 | 27,540 | 11,100 |
| Bingham | 480 | 1,320 | 2,057,900 | 458,520 | 258,580 | 199,940 |
| Blaine | 162 | 288 | 635,150 | 57,000 | 23,425 | 33,575 |
| Boise | 59 | 71 | 59,000 | 22,140 | 7,080 | 15,060 |
| Canyon | 362 | 685 | 9,313,000 | 556,000 | 106,000 | 450,000 |
| Cassia | 71 | 118 | 1,064,000 | 79,990 | 8,835 | 68,155 |
| Custer | 69 | 95 | 70,400 | 14,140 | 7,410 | 6,730 |
| Elmore | 71 | 31 | 410,500 | 44,000 | 1,300 | 42,700 |
| Fremont | 240 | 718 | 706,300 | 271,570 | 174,275 | 97,295 |
| Lemhi | 59 | 95 | 53,000 | 20,460 | 12,200 | 8,260 |
| Lincoln | 206 | 255 | 4,366,000 | 430,250 | 55,720 | 374,540 |
| Oneida | 139 | 197 | 731,000 | 81,500 | 63,230 | 18,270 |
| Owyhee | 83 | 55 | 1,305,000 | 69,600 | 13,100 | 56,500 |
| Twin Falls | 139 | 1,500 | 4,500,000 | 400,000 | 110,000 | 290,000 |
| Washington | 63 | 110 | 112,900 | 34,920 | 28,850 | 14,070 |
| Malheur (Oregon) | 57 | 115 | 225,000 | 38,000 | 13,500 | 24,500 |
| Totals | 2628 | 6,373 | \$27,431,325 | 2,869,896 | 996,570 | 1,871,336 |

PROSPECTIVE CANALS.

- 100,000 Acres—Source of Water Supply, Bruneau River. Land is on South side of Snake River, South of Mountain Home. About \$45,000.00 has already been expended.
- 30,000 Acres—Source of Water Supply, Sinker Creek. Land is on South side of Snake River near Murphy, Idaho.
- 20,000 Acres—Source of Water Supply, South Fork of Snake River. Land lies Southeast of St. Anthony in Teton Valley.
- 30,000 Acres—Source of Water Supply, Goose Creek. Land is on South side of Snake River, near Burley, Idaho, on Minidoka & South-western Branch of Oregon Short Line R. R.
- 50,000 Acres—Source of Water Supply, Raft River in Idaho. Land lies between American Falls on O. S. L. and Kelton on S. P.
- 100,000 Acres—Source of Water Supply, Lost River. Land lies in vicinity of Arco, Idaho, on Mackay Branch of O. S. L. R. R.
- 60,000 Acres—Source of Water Supply, Fontenelle and Green Rivers, about 20 miles Northwest of Granger, Wyoming.

390,000 Acres.

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construct'n | Total Acres Under Can'l | Cultivated | Uncultivated |
|------------|--------------------------------|-------------------------|--------------|-------------------|---------------------|-------------------|----------------------|---------------------|-------------------------|------------|--------------|
| Ada..... | Ridenbaugh Canal Co..... | R. E. Green..... | Boise..... | Boise River..... | 52 | 110 | 75,000 | \$ 400,000 | 80,000 | 28,000 | 52,000 |
| Ada..... | Settlers Canal Co..... | W. N. Elkington..... | Boise..... | Boise River..... | 20 | 90 | 30,000 | 250,000 | 52,000 | 15,500 | 36,500 |
| Ada..... | Farmers Union Ditch Co..... | P. S. Palmer..... | Boise..... | Boise River..... | 24 | 30 | ..... | 68,500 | 12,000 | 5,000 | 7,000 |
| Ada..... | New York Canal Co..... | Edw. Smith..... | Boise..... | Boise River..... | 30 | 65 | 15,000 | 300,000 | 55,000 | 11,000 | 44,000 |
| Ada..... | Indian Creek Reservoir Co..... | M. A. Regan..... | Boise..... | Indian Creek..... | 10 | ..... | Reservoir | 120,000 | 500 | 120 | 380 |
| Ada..... | Boise Canal Company..... | Geo. D. Ellis..... | Boise..... | Boise River..... | 6 | 12 | 3,000 | 17,000 | 3,000 | 3,000 | ..... |
| Ada..... | Boise Ditch Company..... | Jos. Perrault..... | Boise..... | Boise River..... | 7 | 30 | 600 | 75,000 | 860 | 525 | 335 |
| Total..... | ..... | ..... | ..... | ..... | 149 | 337 | ..... | \$1,230,500 | 203,360 | 63,145 | 140,215 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construct'n | Total Acres Under Can'l | Cultivated | Uncultivated |
|--------------|-------------------------------|-------------------------|-------------------|----------------------|---------------------|-------------------|----------------------|---------------------|-------------------------|------------|--------------|
| Bannock..... | McCarron Ditch Co., Ltd..... | W. W. Lewis..... | McCarron..... | Portneuf River..... | 5 | 5 | 2,500 | \$ 12,000 | 7,500 | 6,500 | 1,000 |
| Bannock..... | Consolidated Canal Co..... | Theo. Robinson..... | Soda Springs..... | Soda Creek..... | 14 | 17 | 7,000 | 95,000 | 12,000 | 4,000 | 8,000 |
| Bannock..... | Jas. Moore..... | Jas. Moore..... | Soda Springs..... | Spring Creek..... | 3 | 17 | 700 | 3,000 | 800 | 480 | 320 |
| Bannock..... | Jas. Strachan..... | Jas. Strachan..... | Soda Springs..... | Ledge Creek..... | 3 | 2 | 750 | 860 | 640 | 160 | 480 |
| Bannock..... | Law Brothers Canal..... | Jas. E. Law..... | Soda Springs..... | Formation Creek..... | 9 | 2 | 600 | 2,000 | 1,200 | 800 | 400 |
| Bannock..... | C. Ponting..... | C. P. Woodall..... | Soda Springs..... | Formation Creek..... | 1 | 1 | 2,300 | 6,000 | 320 | 80 | 240 |
| Bannock..... | Lodge's Community Ditch..... | Geo. Nichols..... | Soda Springs..... | Toole Lake..... | 4 | 6 | 800 | 4,000 | 1,600 | 1,250 | 350 |
| Bannock..... | P. C. Hancock..... | P. C. Hancock..... | Downey..... | Yago Creek..... | 5 | 13 | 700 | 2,000 | 160 | 75 | 85 |
| Bannock..... | J. K. Hillman, Jr..... | J. K. Hillman, Jr..... | Downey..... | Marsh Creek..... | 5 | 11 | 500 | 1,500 | 640 | 500 | 140 |
| Bannock..... | C. R. Evans..... | C. R. Evans..... | Downey..... | Cherry Creek..... | 2 | 13 | 350 | 800 | 400 | 300 | 100 |
| Bannock..... | Henderson Brothers..... | Jas. Henderson..... | Oneida..... | Birch Creek..... | 9 | 18 | 600 | 2,000 | 880 | 500 | 386 |
| Bannock..... | N. S. Coffin..... | N. S. Coffin..... | Carl..... | Hawkins Creek..... | 4 | 20 | ..... | 6,025 | 3,520 | 1,375 | 2,145 |
| Bannock..... | McCarron Ditch Co..... | D. R. Lish..... | McCarron..... | Portneuf River..... | 4 | 3 | 7,500 | 9,000 | 2,500 | 2,000 | 500 |
| Bannock..... | Portneuf-Marsh Valley Co..... | Jos. Burns..... | Downey..... | Portneuf River..... | 50 | 50 | ..... | 275,000 | 20,000 | 12,000 | 8,000 |
| Total..... | ..... | ..... | ..... | ..... | 124 | 174 | ..... | \$421,125 | 52,806 | 30,380 | 22,426 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construct'n | Total Acres Under Can'l | Cultivated | Uncultivated |
|------------|---------------------------------|-------------------------|----------------|----------------------|---------------------|-------------------|----------------------|---------------------|-------------------------|------------|--------------|
| Boise..... | J. H. Holbrook..... | J. H. Holbrook..... | Ola..... | Squaw Creek..... | 3 | 6 | 360 | \$ 3,000 | 470 | 360 | 110 |
| Boise..... | Jas. Ballantyne..... | Jas. Ballantyne..... | Ola..... | Squaw Creek..... | 4 | 1 | 150 | 1,000 | 250 | 240 | 10 |
| Boise..... | Thos. D. Patterson..... | Thos. D. Patterson..... | Crawford..... | Beaver Creek..... | 7 | 9 | 800 | 2,000 | 900 | 400 | 500 |
| Boise..... | J. N. Congers..... | J. N. Congers..... | Alpha..... | Big Creek..... | 3 | 3 | 600 | 2,000 | 640 | 160 | 480 |
| Boise..... | Warner Brothers..... | Warner Brothers..... | Alpha..... | Big Creek..... | 4 | 3 | 1,500 | 4,000 | 1,500 | 600 | 900 |
| Boise..... | Lower Squaw Creek Ditch Co..... | Geo. W. Williams..... | Sweet..... | Squaw Creek..... | 5 | 5 | 2,000 | 8,000 | 1,280 | 750 | 530 |
| Boise..... | Settlers Ditch Company..... | Ison Spadin..... | Roseberry..... | Gold Fork Creek..... | 6 | 2 | 1,500 | 4,000 | 1,100 | 320 | 780 |
| Boise..... | Boulder Canal Company..... | M. S. Nelson..... | Roseberry..... | Boulder Creek..... | 12 | 13 | 6,000 | 12,000 | 5,000 | 1,200 | 3,750 |
| Boise..... | Gold Fork Canal..... | M. S. Nelson..... | Roseberry..... | Gold Fork Creek..... | 15 | 22 | 8,750 | 23,000 | 11,000 | 3,000 | 8,000 |
| Total..... | ..... | ..... | ..... | ..... | 59 | 71 | ..... | \$ 59,000 | 22,140 | 7,080 | 15,060 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construction | Total Acres Under Can. | Cultivated | Uncultivated |
|-----------|--------------------------------|-------------------------|--------------|-------------------|---------------------|-------------------|----------------------|----------------------|------------------------|------------|--------------|
| Bear Lake | Skinner Irrigation Co. | N. A. Skinner | Nauman | Skinner Creek | 4 | 10 | 800 | \$ 2,100 | 1,360 | 1,200 | 160 |
| Bear Lake | Fish Haven Irrigation Co. | W. H. Gardner | Fish Haven | Fish Haven Creek | 15 | 25 | 2,000 | 7,000 | 2,400 | 1,200 | 1,200 |
| Bear Lake | Eight Mile Ditch Co. | J. W. Gardner | Soda Springs | Three Mile Creek | 3 | 12 | 700 | 2,000 | 700 | 700 | 200 |
| Bear Lake | Pegram Irrigation Co. | Byron S. Nelson | Pegram | Bear River | 3 | 7 | 1,200 | 3,000 | 1,500 | 1,200 | 300 |
| Bear Lake | Southfield Irrigation Co. | W. G. Hayward | Paris | Paris Creek | 3 | 7 | 300 | 1,350 | 320 | 225 | 95 |
| Bear Lake | Preston & Montpelier Ditch Co. | C. E. Stewart | Wardrobe | Bear River | 10 | 20 | 3,600 | 14,500 | 3,600 | 3,600 | 600 |
| Bear Lake | Bloomington Irrigation Co. | E. M. Patterson | Bloomington | Bloomington Creek | 5 | 15 | 2,000 | 8,000 | 2,000 | 1,600 | 400 |
| Bear Lake | Dingle Irrigation Co. | J. R. Sheppard | Dingle | Bear River | 4 | 15 | 1,500 | 7,000 | 1,420 | 1,420 | 400 |
| Bear Lake | Pioneer Irrigation & Mig Co. | A. Quayle | Paris | Paris Creek | 5 | 12 | 1,800 | 8,000 | 1,700 | 1,700 | 50 |
| Bear Lake | Liberty Hill Slide Canal Co. | J. R. Morgan | Liberty | Mill Creek | 3 | 3 | 320 | 900 | 320 | 270 | 50 |
| Bear Lake | Starr Irrigation Co. | H. P. Scofield | Fish Haven | Fish Haven Creek | 4 | 4 | 200 | 1,200 | 320 | 225 | 95 |
| Bear Lake | St. Charles Irrigation Co. | D. H. Blade | St. Charles | Big Creek | 8 | 16 | 3,000 | 15,000 | 3,000 | 3,000 | 7,000 |
| Bear Lake | Montpelier Irrigation Dist. | John R. Brennan | Montpelier | Bear River | 27 | 54 | 12,000 | 98,000 | 17,000 | 10,000 | 7,000 |
| Bear Lake | Mill Canyon North Canal Co. | Sam'l E. Haymas | Liberty | Mill Creek | 2 | 10 | 3,000 | 2,500 | 3,000 | 2,000 | 1,000 |
| Total | | | | | 95 | 209 | | \$170,550 | 38,640 | 27,540 | 11,100 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construction | Total Acres Under Can. | Cultivated | Uncultivated |
|---------|------------------------------|--------------------------|--------------|-----------------|---------------------|-------------------|----------------------|----------------------|------------------------|------------|--------------|
| Bingham | Great Feeder Canal Co. | Adam Sauer | Coltman | Snake River | 26 | 130 | 110,000 | \$ 80,000 | 72,000 | 55,000 | 17,000 |
| Bingham | Snake River Valley Canal Co. | W. C. Nickelson | Shelley | Snake River | 5 | 16 | 22,000 | 65,000 | 23,000 | 15,000 | 8,000 |
| Bingham | Blackfoot Irrigation Co. | C. Whitten | Blackfoot | Snake River | 8 | 60 | 15,000 | 50,000 | 15,000 | 13,000 | 2,000 |
| Bingham | Idaho Canal & Improv't Co. | J. H. Brady | Pocatello | Snake River | 95 | 155 | 75,000 | 450,000 | 75,000 | 46,000 | 29,000 |
| Bingham | Taylor & Goshen Canal Co. | J. H. Brady | Pocatello | Snake River | 18 | 10 | 5,000 | 36,000 | 7,000 | 5,500 | 1,500 |
| Bingham | Harrison Canal & Irrig. Co. | Jas Steele | Leorine | Snake River | 14 | 35 | 13,000 | 35,000 | 20,000 | 9,000 | 11,000 |
| Bingham | Farmers Progress Canal Co. | Roberts Slough Ditch Co. | Idaho Falls | Snake River | 87 | 500 | 62,000 | 370,000 | 52,000 | 47,000 | 5,000 |
| Bingham | Crabets Slough Ditch Co. | L. M. Capps | Blackfoot | Snake River | 6 | 10 | 12,000 | 20,000 | 8,000 | 7,000 | 1,000 |
| Bingham | F. C. Stevens | F. C. Stevens | Blackfoot | Blackfoot River | 2 | 5 | 500 | 7,000 | 640 | 250 | 390 |
| Bingham | Watson Slough Ditch | Jo. Jarvis | Blackfoot | Snake River | 2 | 3 | 1,000 | 350 | 700 | 350 | 350 |
| Bingham | Lava Slide Ditch Co. | John A. Watson | Thomas | Snake River | 10 | 25 | 3,000 | 20,000 | 5,000 | 3,500 | 1,500 |
| Bingham | Wearwick Ditch Company | J. S. Kindle | Blackfoot | Snake River | 10 | 20 | 7,000 | 18,000 | 7,000 | 5,000 | 2,000 |
| Bingham | W. B. Stufflebean | Lot Adams | Riverside | Snake River | 6 | 5 | 1,500 | 6,500 | 1,440 | 1,340 | 100 |
| Bingham | Dauskin Ditch Company | W. B. Stufflebean | Tilden | Louis Creek | 6 | 5 | 480 | 3,500 | 780 | 600 | 180 |
| Bingham | Trego Ditch Company | H. Grinnett | Bryan | Snake River | 11 | 35 | 10,000 | 41,000 | 10,000 | 6,500 | 3,500 |
| Bingham | Wearwick Ditch Company | A. W. Trago | Blackfoot | Snake River | 5 | 5 | 3,000 | 6,000 | 2,000 | 1,950 | 50 |
| Bingham | Nelson & Baker | Patrick Murphy | Irwin | Snake River | 5 | 12 | 1,000 | 4,800 | 1,440 | 800 | 640 |
| Bingham | R. G. Wright | Jos. A. Nelson | Thomson | Snake River | 4 | 8 | 1,000 | 3,400 | 1,280 | 640 | 640 |
| Bingham | G. C. Wright | R. R. Sinclair | Victor | Truin Creek | 4 | 14 | 2,000 | 25,000 | 1,840 | 1,100 | 740 |
| Bingham | Ann. Falls Canal & Pwr. Co | R. J. Evans | Idaho Falls | Snake River | 60 | 80 | 90,000 | 600,000 | 104,000 | 10,000 | 94,000 |
| Bingham | Gardner Canal Company | L. Smith | Salt Lake | Snake River | 16 | 2 | 22,000 | 9,000 | 2,500 | 150 | 2,350 |
| Bingham | Enterprise Canal Company | Ammon | Snake River | Snake River | 7 | 25 | 15,000 | 28,000 | 15,000 | 8,000 | 7,000 |
| Bingham | Riley Canal Company | Prospect | Snake River | Snake River | 4 | 9 | 12,000 | 14,000 | 3,000 | 1,200 | 1,800 |
| Bingham | New Succeeded Ir. Dist. | J. H. Riles | Idaho Falls | Snake River | 40 | 25 | 26,000 | 120,000 | 21,000 | 15,000 | 6,000 |
| Bingham | City of Idaho Falls | C. F. Anderson | Idaho Falls | Snake River | 5 | 8 | 7,000 | 30,000 | 2,000 | 1,000 | 1,000 |
| Bingham | Swan Valley Irrigation Co. | D. G. Platt | Irwin | Pallsade Creek | 8 | 17 | 4,000 | 4,000 | 2,400 | 2,000 | 1,400 |
| Bingham | Eastern Idaho Water Co. | Chas. S. Smis | Blackfoot | Blackfoot River | 10 | 15 | 5,000 | 5,000 | 2,500 | 2,000 | 300 |
| Total | | | | | 480 | 1320 | | \$2,057,900 | 458,520 | 258,580 | 199,940 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Lateral | Cubic In. Per second | Cost of Construct'n | Total Acres Under Can'l | Cultivated | Un-cultivated |
|--------|-----------------------------|-------------------------|--------------|-------------------|---------------------|------------------|----------------------|---------------------|-------------------------|------------|---------------|
| Blaine | B. F. Jeffries | B. F. Jeffries | Soldier | Soldier Creek | 24 | 3 | 300 | \$ 300 | 320 | 300 | 20 |
| Blaine | John Hulstrom | John Hulstrom | Soldier | Soldier Creek | 4 | 8 | 600 | 600 | 700 | 600 | 100 |
| Blaine | Wm. McCann | Wm. McCann | Soldier | Soldier Creek | 2 | 5 | 300 | 700 | 320 | 250 | 70 |
| Blaine | Fin Lake Irrigation Co. | Lester Scott | Soldier | Spring Creek | 12 | 10 | 1,000 | 40,000 | 10,000 | 5,000 | 5,000 |
| Blaine | E. R. Hawley | E. R. Hawley | Clyde | Little Lost River | 3 | 5 | 800 | 6,000 | 1,000 | 500 | 500 |
| Blaine | A. J. Knollin | A. J. Knollin | Howe | Little Lost River | 3 | 6 | 300 | 300 | 300 | 300 | 120 |
| Blaine | John R. Rogers | John R. Rogers | Howe | Little Lost River | 3 | 6 | 380 | 500 | 300 | 380 | 300 |
| Blaine | Wayne Darlington | W. Darlington | Darlington | Little Lost River | 3 | 17 | 600 | 12,000 | 320 | 320 | 2,000 |
| Blaine | Up. Sullivan & Harper Ditch | Henry Harper | Lost River | Big Lost River | 10 | 17 | 2,500 | 4,000 | 4,000 | 2,000 | 2,000 |
| Blaine | A. N. Anderson | A. N. Anderson | Moore | Lost River | 5 | 20 | 800 | 1,200 | 800 | 800 | 2,550 |
| Blaine | Island Ditch Company | Jas. D. Martin | Lost River | Lost River | 16 | 3 | 3,000 | 20,000 | 4,800 | 2,250 | 195 |
| Blaine | O. B. Fletcher | O. B. Fletcher | Arco | Big Lost River | 3 | 320 | 320 | 400 | 320 | 125 | 800 |
| Blaine | Arco Trading Co. | Geo. E. Ferris | Arco | Big Lost River | 4 | 10 | 1,000 | 3,000 | 1,000 | 200 | 3,000 |
| Blaine | Little Wood River Canal Co. | S. P. Richards | Carey | Little Wood River | 14 | 16 | 2,500 | 11,000 | 7,000 | 4,000 | 500 |
| Blaine | Kilpatrick Bros. Co. | S. W. Wilson | Picabo | Silver Creek | 3 | 15 | 1,000 | 10,000 | 2,000 | 1,500 | 60 |
| Blaine | Fred W. Porter | Fred W. Porter | Picabo | Silver Creek | 2 | 8 | 200 | 500 | 100 | 100 | 160 |
| Blaine | John Wardrop | John Wardrop | Soldier | Soldier Creek | 1 | 2 | 250 | 600 | 100 | 100 | 220 |
| Blaine | John Finch | John Finch | Soldier | Soldier Creek | 4 | 3 | 360 | 1,500 | 640 | 420 | 490 |
| Blaine | F. W. Hastings | F. W. Hastings | Soldier | Deer Creek | 3 | 5 | 450 | 550 | 740 | 250 | 440 |
| Blaine | Nels Peterson | Nels Peterson | Soldier | Soldier Creek | 2 | 3 | 250 | 650 | 240 | 240 | 460 |
| Blaine | Samuel Chaney | Samuel Chaney | Stanton | Spring Creek | 3 | 3 | 700 | 2,200 | 700 | 200 | 200 |
| Blaine | C. M. Black | C. M. Black | Bellevue | Wood River | 10 | 9 | 320 | 1,600 | 400 | 200 | 60 |
| Blaine | Mrs. Minnie Brown | Mrs. Minnie Brown | Bellevue | Wood River | 15 | 9 | 200 | 300 | 240 | 80 | 200 |
| Blaine | S. P. Dittoe | S. P. Dittoe | Bellevue | Wood River | 10 | 10 | 360 | 2,100 | 360 | 160 | 430 |
| Blaine | Chas. H. Furey | Chas. H. Furey | Leslie | Big Lost River | 5 | 12 | 1,350 | 3,500 | 1,230 | 800 | 1,000 |
| Blaine | Dry Creek Canal Company | Parry Baysinger | Clyde | Dry Creek | 1 | 15 | 750 | 1,500 | 1,000 | 1,000 | 1,900 |
| Blaine | Houston Ditch Company | Wayne Darlington | Darlington | Lost River | 13 | 27 | 2,500 | 10,000 | 2,500 | 250 | 15,000 |
| Blaine | B. F. Morrison | B. F. Morrison | Martin | Spring Creek | 3 | 4 | 80 | 200 | 250 | 250 | 33,575 |
| Blaine | Glenns Ferry Land & Ir. Co. | C. H. Hammett | Boise | Malad River | 18 | 12 | 500 | 500,000 | 5,000 | 23,425 | 33,575 |
| Total | | | | | 162 | 288 | | \$635,150 | 57,000 | 23,425 | 33,575 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Lateral | Cubic In. Per second | Cost of Construct'n | Total Acres Under Can'l | Cultivated | Un-cultivated |
|--------|------------------------------|-------------------------|---------------------------|---------------------------|---------------------|------------------|----------------------|---------------------|-------------------------|------------|---------------|
| Elmore | Glenns Ferry Irrigation Co. | E. Pearson | Glenns Fe. ry | Malad River | 30 | 8 | 21,000 | \$300,000 | 20,000 | 1,000 | 20,000 |
| Elmore | Elmore Irrig. Farms Ass'n | I. A. Herron | Moun. Home Canyon Creek | Glenns Ferry Canyon Creek | 13 | 7 | 7 | 60,000 | 2,000 | 300 | 1,000 |
| Elmore | Herron Reservoir & Canal Co. | J. H. Garrett | Glenns Ferry Canyon Creek | Moun. Home Canyon Creek | 20 | 24 | Reservoir | 8,000 | 2,000 | 300 | 1,700 |
| Elmore | Long Tom Irrigation Co. | J. H. Garrett | Moun. Home Canyon Creek | | 20 | 24 | Reservoir | 42,500 | 20,000 | 300 | 20,000 |
| Total | | | | | 71 | 31 | | \$410,500 | 44,000 | 1,300 | 42,700 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construction | Total Acres Under Can. | Cultivated | Uncultivated |
|--------|------------------------------|-------------------------|-----------------------------|-----------------|---------------------|-------------------|----------------------|----------------------|------------------------|------------|--------------|
| Canyon | Riverside Irrig. & Canal Co. | E. M. Kirkpatrick | Parma | Boise River | 30 | 80 | 10,000 | \$ 80,000 | 15,000 | 8,000 | 7,000 |
| Canyon | Lower Payette Ditch Co. | W. A. Coughanour | Payette | Payette River | 19 | 25 | 6,000 | 25,000 | 25,000 | 20,000 | 5,000 |
| Canyon | Last Chance Ditch Co. | Otto Wilholm | Emmett | Payette River | 9 | 50 | 9,000 | 75,000 | 10,000 | 8,500 | 1,500 |
| Canyon | Farmers Co-op Irrig. Co. | Chas. B. Cox | Payette | Payette River | 35 | 100 | 60,000 | 350,000 | 40,000 | 13,000 | 27,000 |
| Canyon | Enterprise Ditch Co. | J. C. Hood | Falks Store | Payette River | 12 | 24 | 15,000 | 15,000 | 3,000 | 2,000 | 1,000 |
| Canyon | Pioneer Irrigation District | R. H. Davis | Caldwell | Boise River | 53 | 260 | 30,000 | 300,000 | 35,000 | 18,000 | 17,000 |
| Canyon | Reed Ditch Company | W. H. Welch | Falks Store | Payette River | 7 | 14 | 1,000 | 3,000 | 2,000 | 1,000 | 1,000 |
| Canyon | Noble Ditch Company | C. B. Cox | Middleton | Boise River | 22 | 50 | 20,000 | 80,000 | 20,000 | 17,000 | 3,000 |
| Canyon | Middleton Canal Company | Peter North | Middleton | Boise Creek | 16 | 25 | 5,000 | 25,000 | 5,000 | 4,300 | 700 |
| Canyon | Farmers Canal Company | S. F. Cheney | Middleton | Boise Creek | 16 | 17 | 4,000 | 25,000 | 5,000 | 4,200 | 800 |
| Canyon | †Payette-Boise Gov. Project | D. W. Ross | Parma | Boise Creek | 23 | 40 | 12,000 | 85,000 | 16,000 | 10,000 | 6,000 |
| Canyon | *Canyon Canal Company | Feris & Kessel | Payette Boise & Snake River | Payette River | 100 | ..... | 350,000 | 7,800,000 | 350,000 | ..... | 350,000 |
| Canyon | | | Emmett | | 20 | ..... | 30,000 | 450,000 | 30,000 | ..... | 30,000 |
| Total | | | | | 362 | 685 | ..... | \$9,313,000 | 1,556,000 | 106,000 | 450,000 |

†Now under way but entire amount of land will not be watered until year 1913.

*Water will be ready for delivery May 1st, 1906.

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construction | Total Acres Under Can. | Cultivated | Uncultivated |
|--------|---------------------------|-------------------------|--------------|------------------|---------------------|-------------------|----------------------|----------------------|------------------------|------------|--------------|
| Cassie | L. N. Norton | L. N. Norton | Rock Creek | Salmon Creek | 3 | 5 | 300 | \$ 6,500 | 640 | 160 | 480 |
| Cassie | Peter Atkins | Peter Atkins | Rock Creek | Rock Creek | 3 | 10 | 500 | 3,000 | 450 | 335 | 115 |
| Cassie | L. M. Condit | L. M. Condit | Malta | Cassie Creek | 4 | 10 | 600 | 3,000 | 680 | 380 | 300 |
| Cassie | J. J. Mabey | J. J. Mabey | Mario | Goose Creek | 3 | 8 | 300 | 2,000 | 900 | 500 | 400 |
| Cassie | Cedar Canal Company | D. B. Nartwell | Boxworth | Cedar Creek | 12 | 25 | 1,000 | 16,000 | 2,000 | 360 | 1,640 |
| Cassie | Island Canal Company | Marlin O'Klerney | Island | Goose Creek | 6 | 6 | 1,000 | 5,000 | 1,680 | 860 | 820 |
| Cassie | West Canal Company | Ester Durfee | Oakley | Goose Creek | 5 | 12 | 1,500 | 5,000 | 5,000 | 3,000 | 2,000 |
| Cassie | John G. Pittin ill | John G. Pittin ill | Elba | Green Canyon Crk | 6 | 8 | 400 | 8,000 | 1,280 | 460 | 820 |
| Cassie | David Hubbard | David Hubbard | Elba | Cassie Creek | 3 | 4 | 400 | 2,000 | 2,000 | 320 | 280 |
| Cassie | John Osterhart | John Osterhart | Canant | Connor Creek | 3 | 5 | 1,000 | 3,000 | 1,200 | 640 | 560 |
| Cassie | A. J. Barker | A. J. Barker | Elba | Dry Creek | 5 | 15 | 700 | 1,500 | 1,200 | 1,000 | 200 |
| Cassie | A. E. Ballis | A. E. Ballis | Elba | Green Canyon Crk | 3 | 6 | 600 | 2,000 | 680 | 500 | 180 |
| Cassie | E. T. Homer | E. T. Homer | Elba | Green Canyon Crk | 3 | 4 | 400 | 6,000 | 480 | 320 | 160 |
| Cassie | †Minidoka Gov. Project | D. W. Ross | Minidoka | Snaue River | 15 | ..... | 60,000 | 1,000,000 | 60,000 | ..... | 60,000 |
| Total | | | | | 71 | 118 | ..... | \$1,064,000 | 76,960 | 8,835 | 68,155 |

†For other half of project see Lincoln County.

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | 'Source of Water | Miles of Main Canal Later ¹ | Miles of Later ¹ | Cubic In. Per second | Cost of Construct ⁿ | Total Acres Under Can ¹ | Cultivated | Un-cultivated |
|----------|-------------------------------|-------------------------|--------------|-------------------|--|-----------------------------|----------------------|--------------------------------|------------------------------------|------------|---------------|
| Fremont. | Independent Canal Co. | M. Hillman | Edmonds | Snake River | 22 | 45 | 20,000 | \$ 60,000 | 10,800 | 7,000 | 3,800 |
| Fremont. | Last Chance Canal Co. | W. E. Whittington | St. Anthony | Snake River | 12 | 25 | 8,000 | 15,000 | 12,000 | 2,000 | 10,000 |
| Fremont. | Dewey Canal Co. | L. C. Rice | St. Anthony | Snake River | 16 | 5 | 3,500 | 10,000 | 2,225 | 800 | 1,425 |
| Fremont. | Marysville Canal & Im. Co. | J. H. Brady | Pocatello | Snake River | 6 | 23 | 15,000 | 10,000 | 20,000 | 9,000 | 11,000 |
| Fremont. | Salem Union Canal Co. | W. M. A. Belknap | Vernon | Snake River | 18 | 65 | 14,000 | 50,000 | 6,000 | 5,000 | 1,000 |
| Fremont. | Farmers Own Ditch Co. | A. M. Slattery | Chester | Fall River | 10 | 8 | 1,200 | 25,000 | 5,000 | 1,000 | 3,400 |
| Fremont. | W. P. Drake Canal | A. Farnsworth | St. Anthony | Fall River | 3 | 3 | 2,000 | 1,500 | 2,500 | 1,500 | 2,000 |
| Fremont. | Hartfield Canal & Irrig. Co. | Geo. Harrifield | Squirrell | Fall River | 12 | 13 | 5,000 | 25,000 | 12,000 | 1,300 | 10,000 |
| Fremont. | Cedar Canal & Irrig. Co. | John E. Hathaway | Chester | Fall River | 4 | 4 | 2,300 | 2,500 | 2,720 | 2,600 | 120 |
| Fremont. | Twin Grove Canal Co. | H. Wright | Wilford | Snake River | 7 | 5 | 12,000 | 20,000 | 4,000 | 4,000 | 1,020 |
| Fremont. | Cherry Canal Co. | Dan I. Walton | Chapin | Darby Creek | 3 | 7 | 2,000 | 4,000 | 1,820 | 800 | 340 |
| Fremont. | Darby Canal Company | Rudolph Blattner | Driggs | Darby Creek | 3 | 2 | 1,200 | 2,000 | 1,240 | 900 | 980 |
| Fremont. | Grand Teton Canal Co. | D. B. Hill | Driggs | Darby Creek | 12 | 65 | 3,800 | 2,500 | 1,640 | 660 | 5,190 |
| Fremont. | Lee Creek Canal Co. | T. R. Wilson | Driggs | Teton Creek | 6 | 15 | 5,000 | 6,700 | 7,200 | 2,010 | 2,000 |
| Fremont. | Jacob Rousche | R. G. Meikel | Leigh | Leigh Creek | 6 | 15 | 4,000 | 5,000 | 4,000 | 2,000 | 1,250 |
| Fremont. | V. C. Hegsted | Jacob Rousche | Leigh | Leigh Creek | 2 | 4 | 1,500 | 2,000 | 3,250 | 2,000 | 3,580 |
| Fremont. | Burgess Canal Co. | Adam Sauer | St. Anthony | Horse Shoe Creek | 18 | 36 | 30,000 | 12,000 | 20,000 | 18,000 | 2,000 |
| Fremont. | Rugby Canal & Irrig. Co. | Joseph Call | Colman | Snake River | 9 | 10 | 6,000 | 8,000 | 6,000 | 5,000 | 1,000 |
| Fremont. | Parks & Lewisville Irrig. Co. | T. R. Ellsworth | Rugby | Snake River | 12 | 100 | 20,000 | 8,000 | 8,500 | 7,500 | 750 |
| Fremont. | Butte & Market Lake Co. | S. W. Laythe | Market Lake | Snake River | 16 | 30 | 16,000 | 65,000 | 16,000 | 10,000 | 6,000 |
| Fremont. | Wm. Hill & Son | Wm. Hill & Son | Oasis | Snake River | 12 | 12 | 700 | 2,000 | 900 | 600 | 300 |
| Fremont. | Canyon Ck. & Irrig. Mfg. Co. | Fred Schwendman | Teton | Canyon Creek | 12 | 12 | 2,000 | 12,000 | 5,000 | 2,400 | 3,000 |
| Fremont. | Teton Irrigation Co. | J. C. Williams | Teton | Teton River | 7 | 8 | 15,000 | 10,000 | 9,000 | 1,800 | 1,800 |
| Fremont. | Rexburg Irrigation Co. | Conrad Walz | Rexburg | Teton River | 13 | 20 | 8,000 | 17,500 | 13,000 | 12,000 | 1,000 |
| Fremont. | Teton Island Canal Co. | E. A. Berry | Rexburg | Teton River | 10 | 10 | 25,000 | 8,000 | 9,000 | 4,000 | 5,000 |
| Fremont. | Island Ward Canal Co. | E. P. Clements | Hibbard | Teton River | 12 | 10 | 25,000 | 50,000 | 21,000 | 18,000 | 3,000 |
| Fremont. | Con. Feeder Canal Co. | John Taylor | Archer | Snake River | 27 | 10 | 10,000 | 1,000 | 315 | 515 | 7,240 |
| Fremont. | D. B. Hawley | D. B. Hawley | Howe | Lost River | 23 | 27 | 10,000 | 17,000 | 13,440 | 6,200 | 7,500 |
| Fremont. | Boone Creek Canal Co. | W. B. Campbell | Squirrell | Boon Creek | 6 | 12 | 10,000 | 40,000 | 6,000 | 4,500 | 2,000 |
| Fremont. | Texas Slough Irrig. Co. | H. C. Hansen | Independence | Snake River | 3 | 1 | 10,000 | 7,000 | 6,320 | 4,320 | 2,000 |
| Fremont. | Rein Canyon Company | H. C. Robinson | Howe | Snake River | 12 | 7 | 14,000 | 40,000 | 15,000 | 10,000 | 5,000 |
| Fremont. | Porter & Milne | H. P. & Milne | Howe | Little Lost River | 12 | 7 | 800 | 1,000 | 14,800 | 13,000 | 2,000 |
| Fremont. | Con. Farmers Canal Co., Ltd. | J. P. Hansen | Salem | Snake River | 12 | 5 | 20,000 | 20,000 | 2,500 | 2,000 | 500 |
| Fremont. | Joseph Gale | Joseph Gale | Hayden | Snake River | 12 | 5 | 20,000 | 2,000 | 2,500 | 2,000 | 500 |
| Fremont. | Egin Irrigation Company | J. D. Phillips | Egin | Snake River | 12 | 5 | 20,000 | 2,000 | 2,500 | 2,000 | 500 |
| Fremont. | Sunnydell Canal Company | Christ Neilson | Sunnydell | Snake River | 12 | 5 | 20,000 | 2,000 | 2,500 | 2,000 | 500 |
| Total | | | | | 240 | 718 | | \$706,300 | 271,370 | 174,275 | 97,295 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construct'n | Total Acres UnderCanal | Cultivated | Un-cultivated |
|-----------|---------------------------|-------------------------|--------------|----------------------|---------------------|-------------------|----------------------|---------------------|------------------------|------------|---------------|
| Custer... | E. B. Curtis... | E. B. Curtis... | Goldberg... | Big Creek... | 8 | 10 | 2,000 | \$ 11,000 | 2,300 | 960 | 1,340 |
| Custer... | Mailzer & Nordstrom... | Mailzer & Nordstrom... | Moore... | Pahimari River... | 4 | 6 | 1,500 | 1,000 | 1,650 | 800 | 850 |
| Custer... | J. P. Dickey... | J. P. Dickey... | Moore... | Big Lost River... | 4 | 5 | 1,000 | 4,000 | 1,000 | 600 | 400 |
| Custer... | Jay Vance... | Jay Vance... | Moore... | Big Lost River... | 4 | 12 | 2,700 | 4,000 | 920 | 800 | 120 |
| Custer... | J. W. Swanger... | J. W. Swanger... | Mackay... | Big Lost River... | 19 | 10 | 3,500 | 30,000 | 3,500 | 1,800 | 1,700 |
| Custer... | Wm. Harris... | Wm. Harris... | Mackay... | Big Lost River... | 4 | 8 | 895 | 3,000 | 900 | 660 | 240 |
| Custer... | Wm. Brown... | Wm. Brown... | Houston... | Big Lost River... | 6 | 6 | 800 | 3,000 | 750 | 510 | 240 |
| Custer... | Michael McGovern... | Michael McGovern... | May... | Pirsinaro Creek... | 6 | 8 | 800 | 2,800 | 860 | 400 | 460 |
| Custer... | Geo. R. Miller... | Geo. R. Miller... | Grouse... | Antelope Creek... | 3 | 3 | 600 | 3,000 | 900 | 360 | 540 |
| Custer... | W. H. Cherry... | W. H. Cherry... | Grouse... | Antelope Creek... | 3 | 3 | 600 | 2,000 | 720 | 200 | 520 |
| Custer... | Gustof Carlson... | Gustof Carlson... | Goldberg... | Little Lost River... | 11 | 19 | 700 | 3,600 | 640 | 320 | 320 |
| Total... | | | | | 69 | 95 | | \$ 70,400 | 14,140 | 7,410 | 6,730 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construct'n | Total Acres UnderCanal | Cultivated | Un-cultivated |
|----------|-------------------------------------|-------------------------|--------------|-----------------|---------------------|-------------------|----------------------|---------------------|------------------------|------------|---------------|
| Lemhi... | D. McNutt... | D. McNutt... | Salmon... | Salmon River... | 4 | 8 | 2,000 | \$ 5,000 | 2,500 | 1,000 | 1,500 |
| Lemhi... | Salmon River Ditch Co. (1) | P. M. Cracken... | Cramer... | Salmon River... | 4 | 9 | 3,000 | 6,000 | 3,000 | 2,000 | 1,000 |
| Lemhi... | N. I. Andrews & Co. (2) | N. I. Andrews... | Salmon... | Salmon River... | 6 | 11 | 1,000 | 5,000 | 1,200 | 600 | 700 |
| Lemhi... | J. O. Swift... | J. O. Swift... | Salmon... | Salmon River... | 6 | 11 | 700 | 5,000 | 1,200 | 600 | 100 |
| Lemhi... | J. H. Wheeler... | J. H. Wheeler... | Baker... | Pratt Creek... | 3 | 7 | 700 | 1,000 | 1,360 | 800 | 560 |
| Lemhi... | Carmenuek Ditch Company | John Samuels... | Salmon... | Salmon River... | 4 | 4 | 1,500 | 5,000 | 1,200 | 800 | 400 |
| Lemhi... | W. H. Andrews Town Ditch Co | W. H. Andrews... | Carmen... | Salmon River... | 7 | 15 | 2,000 | 4,000 | 3,000 | 1,000 | 2,000 |
| Lemhi... | US Small Ditches Private Farmers... | W. H. Andrews... | Salmon... | Lemhi River... | 24 | 25 | 5,000 | 18,000 | 6,000 | 4,500 | 1,500 |
| Total... | | | | | 59 | 95 | | \$53,000 | 20,460 | 12,200 | 8,260 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construct'n | Total Acres UnderCanal | Cultivated | Un-cultivated |
|------------|-------------------------------------|-------------------------|---------------|----------------------|---------------------|-------------------|----------------------|---------------------|------------------------|------------|---------------|
| Lincoln... | Thompson & Perrine... | E. M. Bell... | Hagerman... | Big Creek... | 5 | 3 | 900 | \$ 3,000 | 700 | 600 | 100 |
| Lincoln... | A. H. Secor... | A. H. Secor... | Hagerman... | Spring Creek... | 3 | 7 | 680 | 3,700 | 680 | 320 | 360 |
| Lincoln... | Poorman Ditch Company | W. Nelson... | Gooding... | Big Wood River... | 6 | 16 | 1,100 | 6,000 | 2,000 | 1,100 | 900 |
| Lincoln... | A. L. Kiser... | A. L. Kiser... | Gooding... | Big Wood River... | 3 | 6 | 300 | 2,000 | 600 | 200 | 400 |
| Lincoln... | W. B. Kelley... | W. B. Kelley... | Gooding... | Little Wood River... | 4 | 8 | 300 | 800 | 360 | 300 | 60 |
| Lincoln... | Martin Johnson... | Martin Johnson... | Gooding... | Wood River... | 2 | 2 | 250 | 1,000 | 320 | 200 | 120 |
| Lincoln... | Big Cottonwood Co. | J. W. Waldron... | Shoshone... | Big Wood River... | 15 | 20 | 8,000 | 10,000 | 8,000 | 7,500 | 500 |
| Lincoln... | 19 Small Companies, Private Ditches | | | | | | | | | | |
| Lincoln... | Mullens Canal & Reser. Co. | C. E. Brainard... | Payette... | Malad River... | 38 | 38 | 7,000 | 9,500 | 6,600 | 4,800 | 1,700 |
| Lincoln... | Minidoka Gov. Project | D. W. Ross... | Minidoka... | Snake River... | 15 | 5 | 10,000 | 30,000 | 15,000 | 600 | 14,400 |
| Lincoln... | Twin Falls North Side Co. | J. B. Perrine... | Twin Falls... | Snake River... | 35 | 15 | 60,000 | 1,300,000 | 60,000 | 40,000 | 60,000 |
| Lincoln... | Clover Creek Twin Falls Co. | J. B. Perrine... | Twin Falls... | Snake River... | 60 | 120 | 181,000 | 1,500,000 | 181,000 | 40,000 | 141,000 |
| Lincoln... | Idaho Irrigation Co. | C. B. Hurtt... | Boise... | Snake River... | 20 | 30 | 3,300 | 1,000,000 | 110,000 | 45,000 | 45,000 |
| Total... | | | | | 206 | 255 | | \$4,366,000 | 480,250 | 55,720 | 374,540 |

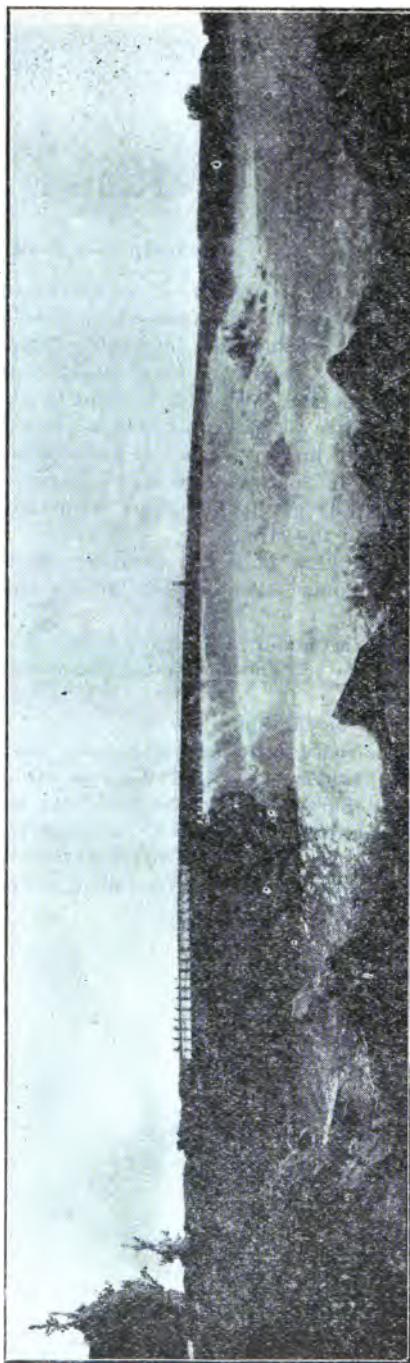
| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Later | Cubic In. Per second | Cost of Construct'n | Total Acres UnderCan | Cultivated | Un-cultivated |
|--------|---|-------------------------|--------------|-----------------|---------------------|----------------|----------------------|---------------------|----------------------|------------|---------------|
| Oneida | Deep Creek Irrigation Co. | D. J. Reynolds | Malad | Deep Creek | 12 | 20 | 6,000 | \$ 22,000 | 4,500 | 3,000 | 1,500 |
| Oneida | Preston, Riverdale & Mink Creek Company | G. E. Garver | Preston | Mink Creek | 23 | 8 | 15,000 | 45,000 | 14,400 | 7,400 | 7,000 |
| Oneida | Riverdale Irrigation Co. | L. A. Meekam | Riverdale | Bear River | 5 | 6 | 800 | 2,000 | 800 | 680 | 120 |
| Oneida | Franklin & Maple Creek Irri. Co. | F. H. Durant | Franklin | Maple Creek | 4 | 8 | 4,000 | 5,000 | 3,000 | 2,000 | 1,000 |
| Oneida | Franklin Cub River Irri. Co. | Wm. Kriup | Franklin | Cub River | 5 | 5 | 700 | 5,000 | 800 | 650 | 150 |
| Oneida | West Cache Canal Co. | Geo. Champ | Logan | Bear River | 40 | 125 | 226,000 | 27,000 | 25,000 | 25,000 | 2,000 |
| Oneida | Oneida Irrigation Co. | A. W. Hart | Preston | Mink Creek | 50 | 25 | Reservoir | 426,000 | 31,000 | 24,500 | 6,500 |
| Total | | | | | 138 | 197 | | \$731,000 | 81,500 | 63,230 | 18,270 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Later | Cubic In. Per second | Cost of Construct'n | Total Acres UnderCan | Cultivated | Un-cultivated |
|--------|---------------------------|-------------------------|---------------|-----------------|---------------------|----------------|----------------------|---------------------|----------------------|------------|---------------|
| Owyhee | Buccaroo Ditch Co. | D. B. Hyde | Bruneau | Bruneau River | 12 | | 2,000 | \$ 20,000 | 5,000 | 5,000 | |
| Owyhee | So. Side Ditch Co. | J. Benhand | Bruneau | Bruneau River | 7 | | 1,200 | 3,000 | 1,200 | 1,200 | |
| Owyhee | Portlock Ditch Company | A. M. Harris | Bruneau | Bruneau River | 8 | | 400 | 4,000 | 700 | 700 | |
| Owyhee | Grand View Ditch Co. | Jas. Garbett | Grand View | Bruneau River | 6 | 20 | 10,000 | 250,000 | 10,000 | 1,000 | 9,000 |
| Owyhee | 26 Small Private Ditches. | C. J. Perkins | Des Moines Ia | | 35 | 35 | 5,000 | 125,000 | 6,000 | 4,500 | 1,500 |
| Owyhee | West End Twin Falls Co. | | | | | | | 1,000,000 | 46,000 | | 46,000 |
| Total | | | | | 83 | 55 | | \$1,305,000 | 69,600 | 13,100 | 56,500 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Later | Cubic In. Per second | Cost of Construct'n | Total Acres UnderCan | Cultivated | Un-cultivated |
|------------|-----------------------------|-------------------------|--------------|-----------------|---------------------|----------------|----------------------|---------------------|----------------------|------------|---------------|
| Twin Falls | Twin Falls Land & Water Co. | F. A. Voigt | Twin Falls | Snake River | 109 | 1,000 | 275,000 | \$2,500,000 | 220,000 | 110,000 | 110,000 |
| Twin Falls | Twin Falls Salmon River Co. | B. Perrine | Twin Falls | Salmon River | 30 | 500 | | 2,000,000 | 180,000 | | 180,000 |
| Total | | | | | 139 | 1,500 | 275,000 | \$4,500,000 | 400,000 | 110,000 | 290,000 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Later | Cubic In. Per second | Cost of Construct'n | Total Acres UnderCan | Cultivated | Un-cultivated |
|------------|----------------------------|-------------------------|---------------|-----------------|---------------------|----------------|----------------------|---------------------|----------------------|------------|---------------|
| Washington | Weiser Irrigation District | O. M. Harvey | Weiser | Weiser River | 17 | 35 | 8,000 | \$ 62,000 | 9,500 | 6,000 | 3,500 |
| Washington | Sunnyside Ditch Company | C. T. Williams | Weiser | Weiser River | 8 | 15 | 850 | 6,500 | 1,500 | 800 | 700 |
| Washington | W. B. Allison | Jno. Schwenfelder | Cambridge | Big Weiser | 8 | 12 | 1,600 | 6,000 | 1,680 | 1,100 | 580 |
| Washington | Jno. Schwenfelder | Jno. Schwenfelder | Cambridge | Little Weiser | 5 | 4 | 1,000 | 2,200 | 900 | 850 | 50 |
| Washington | Middle Valley Irrig. Co. | J. H. Rhea | Middle Valley | Weiser River | 4 | 14 | 3,000 | 10,000 | 3,500 | 3,000 | 500 |
| Washington | J. H. Bolan | J. H. Bolan | Meadows | Goose Creek | 4 | 6 | 600 | 5,000 | 900 | 800 | 100 |
| Washington | E. L. Osborn | E. L. Osborn | Meadows | Goose Creek | 7 | 2 | 800 | 1,000 | 680 | 500 | 180 |
| Washington | Small Private Ditches | A. Brockman | Weiser | Payette River | 2 | 4 | 1,000 | 1,200 | 1,200 | 800 | 400 |
| Washington | Extension Ditch Co. | | | | 8 | 18 | 2,500 | 19,000 | 15,000 | 7,000 | 8,000 |
| Total | | | | | 63 | 110 | | \$112,900 | 34,920 | 20,850 | 14,070 |

| County | Corporate Name of Company | Name of Party In Charge | Headquarters | Source of Water | Miles of Main Canal | Miles of Laterals | Cubic In. Per second | Cost of Construction | Total Acres Under Canals | Cultivated | Uncultivated |
|------------|--------------------------------|-------------------------|--------------|------------------|---------------------|-------------------|----------------------|----------------------|--------------------------|------------|--------------|
| ..... | Nevada Ditch Company..... | C. L. King..... | Ontario..... | Malheur..... | 16 | 30 | 4,000 | \$ 55,000 | 10,000 | 4,000 | 6,000 |
| ..... | Owyhee Ditch Company..... | C. L. King..... | Ontario..... | Owyhee..... | 26 | 50 | 10,000 | 150,000 | 22,000 | 7,000 | 15,000 |
| ..... | Ontarian Land & Irrig. Co..... | Wm. E. Lees..... | Ontario..... | Snake River..... | 15 | 35 | 800 | 20,000 | 6,000 | 2,500 | 3,500 |
| Total..... | ..... | ..... | ..... | ..... | 57 | 115 | ..... | \$225,000 | 38,000 | 13,500 | 24,500 |



Twin Falls Dam and Regulating Devices.

Kansas

Garden City Project.

(Write Supt. of Operation, U. S. Reclamation Service, Deerfield, Kansas; Finney County Water Users' Association, Garden City, Kansas.)

This project was indulged largely for educational purposes, being illustrative of how easily relatively small tracts might be irrigated, with a view, through the advantage developed, to point to private capital the enhancement in realty when proper water supply was assured.

With this end in view, a tract of 8,600 acres just east of Deerfield and north of Garden City, in Southwestern Kansas, was selected. An attempt was made to supply water by gravity diversion from the river and failed because of the uncertain flow of the stream.

Then wells were sunk and pumping plants installed. There are twenty-three such pumping stations, each driven electrically from a central power plant.

The land is all under private ownership and is held at \$75 per acre up. The water right costs \$35 and the maintenance charge is \$2.75 an acre. The unit is 160 acres.

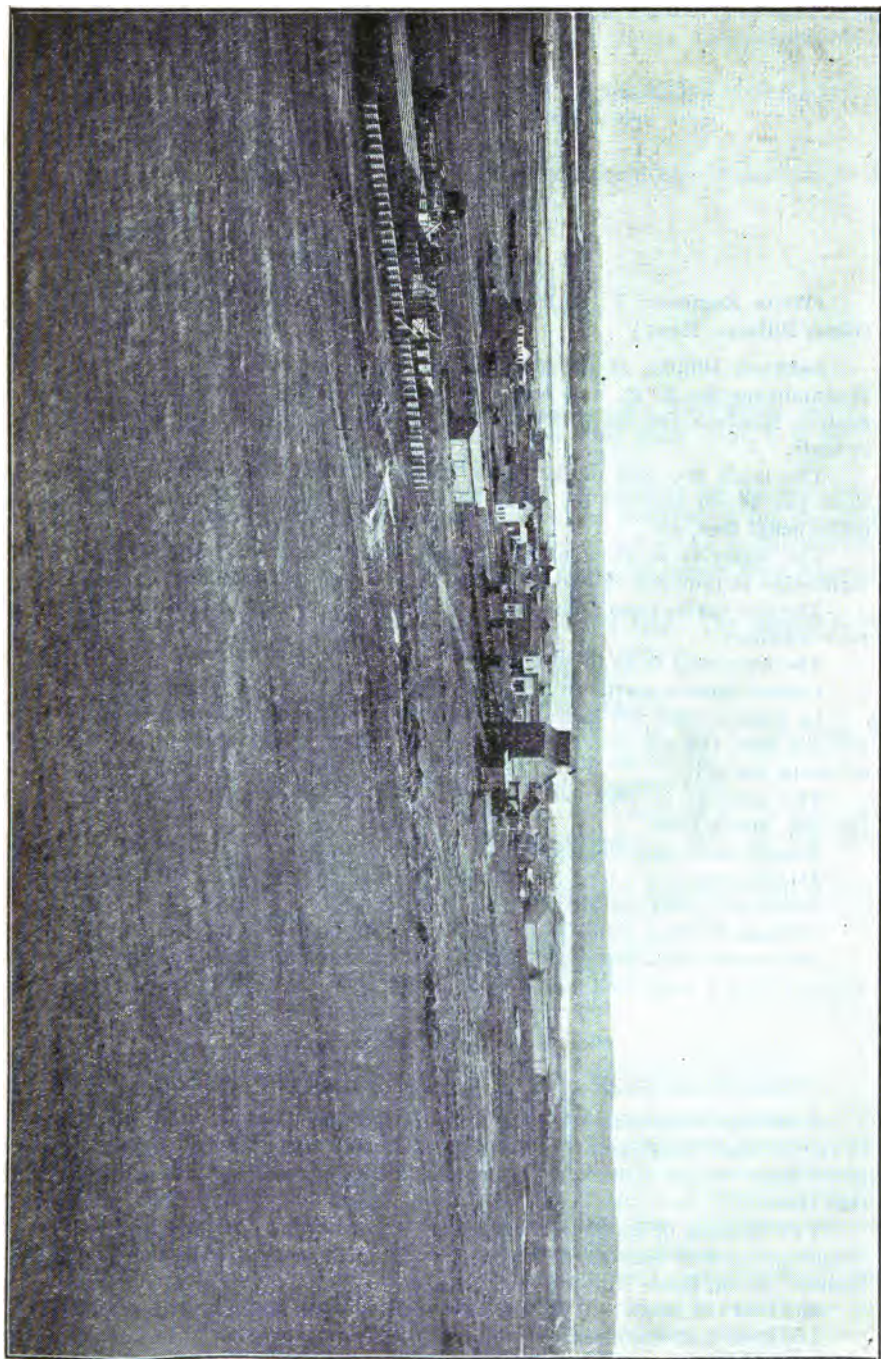
The land is on the Santa Fe.

The soil is rich prairie loam and grows alfalfa, grain, beets and cantaloupes.

Constant residence is required on or within 20 miles of the land until all Governmental charges against the land have been paid.

Average elevation, 2,925 feet. Average rainfall, 20 inches. Temperature ranges from 20 deg. below zero to 110 deg. above.

Garden City is the largest town near the project.



View of Buford. A Town on the Buford-Trenton Project

Montana

Huntly Project.

(Write Engineer, U. S. Reclamation Service, Huntly, Mont.; U. S. Land Office, Billings, Mont.)

Between Huntly, at the junction of the N. P. and C. B. & Q., and Bull Mountain on the N. P., and stretching along the Yellowstone River in South-eastern Montana are the 30,000 acres that it is the intention of this project to irrigate.

The lands are part of the Crow Indian Reservation and the homesteader must pay \$4 per acre for his lands for the benefit of these Indians, besides the other usual fees, etc.

The water is supplied mainly by gravity, although a pumping plant near Ballantine is required to elevate water to the high line canal.

The soil varies from a fine sandy loam to a heavy clay and in some places is very alkaline.

The farm unit is 40 to 80 acres.

Deeded land is worth from \$75 to \$200 per acre when irrigated.

In August, 1908, 250 farm units were still unclaimed. The water right costs \$30 per acre and ten years' time is given. There is a maintenance charge of 60 cents per acre.

The altitude is 3000 feet. Thermometer ranges from 35 deg. below to 100 deg. above zero.

Alfalfa, grain and vegetables are produced.

Alfalfa produces 5 tons, three crops a year; oats as high as 100 bushels.

There is a good market within the state.

Billings, thirteen miles from Huntly, is the nearest large town.

There are eight townsites laid out on the project. Some of the town lots are of 1, 2 or 3 acres and may be purchased from the Government.

Milk River (including St. Mary.)

(Write Project Engineer U. S. Reclamation Service, Malta, Mont.)

A storage reservoir called the Chain Lakes Reservoir is being constructed in the St. Mary basin and through a 25-mile canal the water is conveyed to the headwaters of the Milk River, thus supplementing the mountain drainage of that river.

Two systems of canals are being constructed. The Chinook unit will serve 100,000 acres near Chinook and Harlem and the Dodson unit 150,000 acres about Dodson, Malta, Saco, Hinsdale and Glasgow.

Some of the lands will be under irrigation near Malta in 1909.

About 50% of the area is public land. The farm unit is 160 acres. The water right will cost about \$25 per acre. Five years residence is required.

The lands stretch for 150 miles along the Milk River Valley in Chauteau and Valley counties, Montana. Latitude 48 deg. 30 m. Longitude 107-110. Townships 3-40 east, Range 27-34 north.

Rainfall, 13½ inches. Temperature from 45 deg. below zero to 105 deg. above. Mean 42 deg. Elevation from 2,000 to 2,400 feet.

The products are hay, grains and forage.

The Great Northern traverses the land and there are 32 stations on the project.

The soil is sandy loam and gumbo.

Irrigated land is worth from \$25 to \$40.

The reservoir capacity is 587,000 acre-feet.

The total length of the canals will be 500 miles.

Sun River Project.

(Write Project Engineer, U. S. Reclamation Service, Fort Shaw, Mont.)

While there is less than 17,000 acres in the Fort Shaw Unit, it is the ultimate intention to reclaim 256,000 acres at this location.

The land is west of the center of the State of Montana, on the east side of the Rocky Mountains. Three big reservoirs will be constructed for the supply of this tract and probably Benton Lake will be utilized as an additional reservoir and perhaps a branch of the Flathead River may be turned from its course as a supplemental supply.

The soil is a sandy loam. Some has considerable clay. The subsoil is clay or gravelly. The tract is 40 by 80 miles and the soil varies.

One may homestead or buy lands at from \$10 up.

There are about 200 farms that may be homesteaded.

A five years' residence is required. The water right will approximate \$30 per acre with 50 cents per acre annual maintenance charge.

The farm unit varies from 40 to 80 acres of irrigable land.

Temperature ranges from 20 degrees below to 100 degrees above zero. Altitude, 3700 feet. Rainfall, 12 inches. Growing season, May to September. Chinook winds near mountains.

Fort Shaw and Simms are on the Fort Shaw units and there will be about 20 towns on the project.

The crops are grain, hay, sugar beets and vegetables.

The Great Northern railroad reaches the project.

Rosebud Project.

(Write Rosebud Land and Improvement Co., Miles City, Montana.)

In Eastern Montana the Rosebud Land and Improvement Company have a tract of land 35 miles long and a few miles in width, stretching from the towns of Forsyth to Miles City. The land was acquired largely by purchase from the Northern Pacific Railroad and includes a portion of the land originally granted to that railroad by the U. S. Government. To this has been added smaller holdings acquired from settlers who had patented their ground.

This land is being placed under irrigation. The diversion is made from the Yellowstone River and a main canal twenty-five miles in length has been constructed. The water right was obtained by appropriation from the State of Montana, and covers 30,000 inches or sufficient to irrigate about 60,000 acres.

Soil: Sandy loam, four to twenty-five feet in depth. Gravel sub-soil; excellent drainage.

Native growths: There is at the present time a considerable area of the land covered by light sage, buffalo grass and "blue-stem." Some of the land has a very heavy growth of cottonwood timber upon it.

Crops: Sugar beets, grain, alfalfa, vegetables, berries, etc. Farm unit limit, 40 to 80 acres.

Cost of land: The land at present may be purchased at from \$50 to \$100 per acre. This price is subject to advance without notice. The usual terms are 10% cash with balance payable in ten equal annual installments with interest at the rate of 10% per annum.

There is no charge for water rights or for water service, but each water user must pay his pro rata portion of the cost of maintenance of the canal system.

Land will not be sold to those who do not cultivate it, and the cultivation of a certain portion of the land held is a condition of the deed.

Climate: The rains fall during May and June. The weather is quite hot during July and August. The temperature ranged from 30 degrees below zero to 70 above in the winter of 1907-08.

Transportation: The C. M. & St. P. traverses the land and the N. P. R. R. parallels the tract just south of and across the Yellowstone River.



Alfalfa Field. Belle Fourche Project.

Nebraska

North Platte Project.

(Write North Platte Valley Water Users' Association, Scottsbluff, Neb., U. S. Land Office, Cheyenne, Wyoming, or Alliance, Neb., or Project Engineer U. S. Reclamation Service, Mitchell, Neb.)

This project has as its object the storage of the flood and surplus waters of the North Platte River in a reservoir created by a dam 215 feet high located in a canyon just below the mouth of the Sweetwater River, near Casper, Wyoming. This is called the Pathfinder Dam and its construction began in 1905. The water stored in this reservoir will be used to supplement the natural water supply during the irrigating season. At such times it is to be released and will flow down the river channel for 90 miles to Whalen, Wyoming, and there it will be diverted into canals which will serve the lands to be irrigated.

While 110,000 acres are embraced in the original project, it is the intention to eventually supply water to about 400,000 acres. Half of this territory is in Wyoming and half in Nebraska. Some of the lands will be irrigated through pumping.

About 80,000 acres have been placed under irrigation at this (1908) writing.

The farm unit is 80 acres. The water cost is \$35 per acre, payable in ten annual installments without interest. There is a further maintenance charge of \$2 per acre, per year. A continual residence of five years is required.

No Government land can be secured at this time, except through the purchase of relinquishments. These cost from \$600 to \$1600 an 80 acre tract, depending upon location.

Deeded land costs from \$25 to \$40 and up per acre.

The land is a heavy sandy loam, free from the alkali and deleterious salts so prevalent in irrigated sections.

The best lands within the project zone are between Scottsbluff and the Nebraska line.

At present the Burlington is the only railroad reaching these lands, although connection with the Union Pacific is promised.

Oats produce 60 bushels; wheat, 20 to 40 bushels; potatoes, 150 to 500 bushels; sugar beets, 15 to 28 tons, and alfalfa from 3 to 5 tons per acre.

The markets are Denver, Omaha, Lincoln and Kansas City.

Altitude 3800 to 4200 feet. Temperature varies from below zero to the hot short summer. There is an average of 135 days between frosts. Virtually no rain falls. There are not half a dozen days a year that are entirely cloudy. There are no fogs.

Syndicatal Projects.

The irrigation of public lands in Nebraska is under the jurisdiction of the State Board of Irrigation, of which the Governor of the State is president and the State Engineer is secretary.

This Board has supplied the following information relative to the more important irrigation projects in Nebraska:

| Acres in Irrig- able Area | Name and location | Cost Estimated by Owners | Amount Completed | Soil | Land Cost per Acre | Altitude | Annual Rainfall | Temperature | Products | R. R. | Nearest Town |
|------------------------------|----------------------------|-----------------------------|---------------------|------------------------|--------------------------|-----------------|--------------------|-------------|----------------------------------|---------|-------------------------|
| 27,000 | Belmont..... | \$94,000 | 60% | Sandy loam | \$30 to \$75 | 3650 | 17.5 | -30 to +105 | alfalfa, grain sugar beets | B. & M. | Bridgeport..... |
| 120,000 | Tri State..... | 1,000,000 | 60% | Sandy and Clay loam | \$30 to \$75 | 3950 | 17.5 | -30 to +105 | alfalfa grain beets | B. & M. | Mitchell..... |
| 16,000 | Mitchell..... | ..... | all | Sandy and Clay loam | \$30 to \$75 | 4050 | 17.5 | -30 to +105 | alfalfa, grain sugar beets | B. & M. | Morrill |
| 14,500 | Gering..... | 166,000 | all | Sandy and Clay loam | \$30 to \$75 | 4000 | 17.5 | -30 to +105 | alfalfa, grain sugar beets | B. & M. | Gering..... |
| 12,000 | Enterprise..... | 31,000 | all | Sandy loam | \$30 to \$75 | 3950 | 17.5 | -30 to +105 | alfalfa, grain sugar beets | B. & M. | Mitchell..... |
| 6,000 | Castle Rock..... | 27,000 | all | Sandy loam | \$30 to \$75 | 3820 | 17.5 | -30 to +105 | alfalfa, grain sugar beets | B. & M. | Minatare..... |
| 17,000 | Minatare..... | 39,000 | all | Sandy loam | \$30 to \$75 | 3820 | 17.5 | -30 to +105 | alfalfa, grain sugar beets | B. & M. | Minatare..... |
| 7,400 | Paxton & Hershey..... | 15,000 | all | Sandy and Clay loam | \$40 to \$80 | 2800 to 2900 | 17.5 | -30 to +105 | alfalfa, grain sugar beets | U. P. | Hershey & N. Platte.... |
| 16,000 | Sutherland & Paxton..... | 37,000 | all | Sandy and Clay loam | \$40 to \$80 | 2960 | 17.5 | -30 to +105 | alfalfa, grain sugar beets | U. P. | Sutherland..... |
| 21,000 | North Platte..... | ..... | all | Sandy and Clay loam | \$40 to \$80 | 28 | 17.5 | -30 to +105 | alfalfa, grain sugar beets | U. P. | North Platte..... |
| 14,000 | Western Irr. District..... | 19,000 | all | Sandy loam | \$40 to \$80 | 3370 | 20. | -30 to +105 | alfalfa, grain sugar beets | U. P. | Big Spring..... |
| 31,000 | Gothenburg..... | 20,000 | all | Sandy and Clay loam | \$40 to \$80 | 2560 | 18. | -30 to +105 | alfalfa, grain sugar beets | U. P. | Gothenburg..... |
| 43,000 | Cosad..... | 95,000 | all | Sandy and Clay loam | \$40 to \$80 | 2490 | 18. | -30 to +105 | alfalfa, grain sugar beets | U. P. | Cosad..... |
| 12,000 | Farmers and Merchants..... | 17,000 | all | Sandy and Clay loam | \$40 to \$80 | 2800 | 18. | -30 to +105 | alfalfa, grain sugar beets | U. P. | No. th Platte..... |
| 15,000 | Culbertson | 110,000 | all | Sandy and Clay loam | \$30 to \$75 | ..... | 22. | -30 to +105 | alfalfa, grain sugar beets | B. & M. | Palisade and Culbertson |

Nevada

Truckee-Carson.

(Write Churchill County Chamber of Commerce, Fallon, Nev.; Project Engineer, United States Reclamation Service, Fallon, Nev.; Land Agent, Central Pacific R. R., or Southern Pacific R. R., Flood Bldg., San Francisco.)

Many generations ago, in what is now Western Nevada, there was a large lake and long before the recollection of man this lake dried up, its bed being marked by a vast silt expanse, including some 350,000 acres, rich in plant-foods but without moisture to germinate plant life.

The soil is a lake sediment and varies from light drifting sands to sandy loams, loams, clay, adobe and black peat soils.

For years this has been called the Carson Sink, although this is a misnomer. The "Sink" has an elevation of 4000 feet and all about it tower mountains, to the west the lofty Sierra Nevadas and to the east, north and south the barren desert hills.

To bring water to this land that it might bear and fructify, the Government has expended \$4,000,000 and the work is practically completed. The water for its irrigation is taken from the Truckee River and turned into the Carson River, and from thence conveyed to the rich bed of the ancient dry lake with a view to converting the barren desert into a land of plenty.

The climate is very dry; the rainfall approximating two inches annually. Temperature ranges from below zero to over 105 deg. Altitude: 4000 feet.

There are several hundred farms open to homeseekers. They are usually 80 acres in size, although there are a few units of 40, 120 and 160 acres. The irrigable land is usually a trifle less than the unit, because of high ground, etc.

The water right costs \$30 per acre, with a yearly maintenance charge, based on actual cost, approximating 60 cents. Five or ten years are allowed to pay the former charge.

Grain and hay are the present products, although gardening at a profit is possible. Hay yields from 5 to 7 tons; wheat 35 bushels; barley 50 bushels and oats 75 bushels per acre.

The settler is required to comply with the law regarding residence, to have at least half of his land under cultivation, and have paid for his water right before he is given a patent.

Private lands without water may be bought for from \$5 to \$20 and with vested water rights at from \$40 to \$75 per acre.

Homesteaders are required to make an advance payment of \$3.40 per acre. Fallon and Hazen are the principal towns.

The produce is sold in the neighboring mining camps.

The land is reached by the Southern Pacific or Central Pacific railroads.



June 5th/08

New Mexico

Carlsbad Project.

(Write Pecos Valley Water Users' Association, Carlsbad, N. M.; U. S. Reclamation Service, Carlsbad, N. M.)

Eddy County (lat. 33 deg. North) lies in the southwest corner of New Mexico and is bounded on the south and east by Texas.

Since 1888 its lands have been partly under irrigation, but the Pecos Irrigation Company's system was small and inadequate. In October, 1904, a flood destroyed the Avalon dam that formed the supply reservoir.

The Irrigating Company was reluctant to furnish the money to repair the loss and as property valued at a couple of million dollars was threatened, an appeal was made to the Government.

In December of that year the Reclamation Service undertook this, only after first acquiring the irrigation works.

The land included in the project is 20,000 acres, and two reservoirs with a total capacity of 63,500 acre-feet have been provided and substantial canals and flumes have been constructed.

The soil is generally a sandy loam 3 to 20 feet in depth, underlaid with gravel or rock.

There are no public lands. Private lands are held at from \$35 up for raw, and \$85 up for cultivated lands. The water right costs \$31 and the maintenance charge is 75 cents per acre per year.

The farm unit is 160 acres.

The altitude is 3100 feet. Rainfall 13 inches. Temperature from 5 deg. below to 112 deg. above zero.

The land being inland and well south, the climate is of course quite warm.

Products are deciduous fruits, grapes, hay, grain, cotton, melons, vegetables, etc.

The Pecos Valley railway reaches Carlsbad and connects with large systems.

Carlsbad is the principal town.

Rio Hondo Project.

(Write Turner-Holmes Land Co., Roswell, New Mexico; Rio Hondo Water Users' Association, Roswell, New Mexico.)

The work on this system is finished. A reservoir is located about 14 miles southwest of Roswell which has a superficial area of 3,000 acres. It will hold 40,000 acre-feet, or sufficient to serve each of the 10,000 acres included within the project zone with four feet of water.

There are no vacant public lands. Deeded lands cost approximately from \$50 to \$100 without water or \$30 more with water. Alfalfa land is held at from \$100 to \$200 and upwards, and orchards at from \$300 to \$500 per acre up.

The soil varies greatly. Some is poor and some very fine.

Crops are alfalfa, deciduous fruits, berries, vegetables and grain.

The water stock costs \$30.00 per acre, payable in 10 annual installments.

The farm unit is 40 acres. Rainfall, 14 inches. Altitude, 3750 feet.

The lands are reached by the P. V. & N. W. R. R., a branch of the Santa Fe. Roswell is the principal town.

Ordinarily the temperature varies from 25 deg. to 102 deg., although about 1904 the thermometer registered 25 deg. below zero for a short time.

NEW MEXICO—TEXAS—MEXICO.

Rio Grande Project and Leasburg Diversion.

(Write El Paso Valley Water Users' Association, El Paso, Texas; Elephant Butte Water Users' Association, Las Cruces, N. M.; Project Engineer, U. S. Reclamation Service, Engle, N. M.)

This involves the construction of a dam 265 feet high opposite Engle, N. M., across the Rio Grande, forming a reservoir 45 miles long with a capacity of two million acre feet for the irrigation of 180,000 acres in Texas, New Mexico and Mexico.

The Leasburg Diversion is a part of this project and covers the construction of a low six-hundred-foot concrete diversion dam, with pier, embankment, head weir, head-gates, sluice gates, etc. The construction of six miles of canal is necessary. This will connect with the old Las Cruces Canal.

Construction was begun in November, 1906.

The territory spreads from Elephant Butte, 12 miles west of Engle, N. M. to a point 30 miles south of El Paso, Texas, in Old Mexico. Over 25,000 acres of the lands reclaimed lie in Mexico and the two governments are working in complete harmony in the interests of their people.

About five years will be required to complete this work.

Land sells at from \$10 to \$25 for raw, and \$60 to \$125 for cultivated, per acre. The soil is alluvium silt and very rich. It is several feet in thickness and has a good subsoil.

Products are grain, fruit and alfalfa.

It is understood that the government land has been withdrawn from settlement until the irrigation system is completed.

All of the irrigable lands under Leasburg diversion are in private ownership. Some may be bought for from \$75 per acre upward.

The water right costs \$40 and the estimated annual maintenance charge figures about 40 cents per acre.

Farm unit, 160 acres. Temperature, 0 deg. to 110 deg. Rainfall, about 10 inches. Altitude, 4000 feet.

Railroad: Santa Fe.

Towns: El Paso, Las Cruces, Rincon, Engle, Mesilla Park, Dona Anna, etc.

The lands south of the border and within Mexico near El Paso, Texas, are held at about \$50 per acre (gold) for raw lands and cultivated lands at about \$100 per acre (gold). These are lands that will be irrigated by this project. The land beyond the limit of the project zone is held at about \$22.50 per acre.

None of these lands are within the possession of the Government. All are in private ownership and it is quite difficult to buy them at any figure from the present owners.

The water right to all lands within the zone of the project, which are located in Mexico, is free to the owner of the land, as this right, under the laws of Mexico, cannot be separated or segregated from the land, but is instead a part of it.

To acquire this land one must first get endorsements from home residents in the United States, then make application through an attorney to acquire title. This title is then taken up by the mayor of the township; from him to the Governor of the state of Chihuahua and then to the Secretary of the Treasury of the Republic of Mexico.

This takes about six months, and when it has been accomplished the title is perfect and as good as if acquired in the United States.

If these Mexican lands are so purchased from the present owners it is almost impossible to acquire them other than by the payment of spot cash.

RECLAMATION IN NEW MEXICO.

To Mr. Vernon L. Sullivan, Territorial Engineer, who is in charge of the waters of New Mexico, the writer is indebted for the very complete and valuable data which follow. Most of this data, with valuable additional matter has been incorporated in a report issued by Mr. Sullivan and published by the Territory of New Mexico.

This report deals with hydraulic power, the size and run-off of rivers and streams and many other matters of pertinent interest to engineers and experts. This book being confined to irrigation matters, has perforce limited its mention to those projects falling directly under that head.

That which follows represents the existing conditions November 30, 1908.

IRRIGATION PROJECTS.

In listing the various irrigation projects in the Territory that have come under the general supervision of this office since the passage of the Irrigation Act of 1907, or within the last year and a half, the writer has, in order to distinguish the degree of development, divided them into the following classes: **First**, projects in which water is now being applied, through already constructed works, to the land and crops being raised from same. **Second**, projects which

have filed applications in this office, some of which have been approved by the Engineer, and others pending. This division represents those projects where the development work is not as yet started or, as in a few cases, the construction work is not yet completed sufficiently for the delivery of water to the land. **Third**, community ditch systems under construction by a body of settlers. **Fourth**, the small filing for a limited acreage, merely to show active development on the small farms, being land generally filed on through homestead and desert entries. **Fifth**, a partial list of the power applications received and approved by the Engineer, showing the rapid development of power interests.

The data for the majority of these projects has been received by this office and each project written up from these reports. The Engineer has endeavored to represent the conditions in these write-ups as he believes them to be, and on those projects whose conditions are but faintly remembered, the description is based solely upon the material given in the reports of their owners.

The lower Pecos Valley of New Mexico has virtually been made by the projects of the Pecos Irrigation and Improvement Company, which was the first; operated upon a large basis and acreage, to be constructed in the Territory. This company constructed, with a great expenditure of capital, two irrigation systems in the lower Pecos Valley. Of these two enterprises one, the lower, later became the property of the Pecos Irrigation Company and this later, as a result of the heavy flood of 1904 aggregating 80,000 second feet and washing away the lower dam of this company, was sold to the U. S. Government and is now one of the five Reclamation Projects in the Territory and also the farthest advanced of any of the Reclamation Service Projects. When this project was constructed in 1890 it contained about 60 miles of irrigating canals and two large storage reservoirs, having a capacity of over 100,000 acre feet. In 1904, at the time of the above-mentioned washout, over 13,000 acres were in actual cultivation and irrigation.

The upper of these two projects became the property of Hon. J. J. Hagerman, under the name of "Northern Canal." This system is, however, now under the ownership of the water users under this canal. This project today is one of the best managed systems, and the land owners under it the most prosperous of any project in the West, being the result of skillful management and a careful study of local conditions.

The Northern Canal derives its supply of water from the Hondo River, near its mouth, and has about 30 miles of canal in operation, successfully irrigating some 8,000 acres of the most fertile soil in the Territory. Under the management of this system the duty of water is about 200 acres per second foot. This is the highest standard for continued economical use in the Territory; however, other enterprises are now doing close to this mark.

One of the oldest propositions in the northern portion of the Territory is the irrigated land on the Maxwell Land Grant. This includes 22,000 acres, operated by the Maxwell Irrigated Land Company, of Maxwell City, N. M.

This irrigated system has a number of reservoirs in connection, acting as equalizing and storage reservoirs. When the Low Line system, which has a capacity of 300 second feet, reaches Reservoir No. 5, the water can be diverted on to Reservoir No. 2, with an area of 324 acres, or can be diverted into Reservoir No. 7, an area of 190.7 acres; thence into No. 8, through which it is carried by a small steel flume with a capacity of 70 second feet. There are

a number of other reservoirs of considerable extent connecting with this system. This company claims to have sufficient data at hand to warrant the expectation that water will be available for, probably, 20,000 acres. Water is being supplied this year to the Maxwell Farm, some 3,840 acres, and to farm lands on the property covering some 3,000 acres more.

From a report submitted to us by the above company regarding the soil, the following is quoted:

"The soils in the vicinity of Maxwell City are practically all alluvial, having been derived from the rocks of the surrounding mountains and mesas. As there is a great deal of lava rock in that part of the country, the decomposition of this rock has contributed materially to the soil formation. Soils derived from volcanic rocks are usually fertile, being rich in potash and phosphoric acid, and this seems to be the case with the soil of the Maxwell City District. They are fairly well supplied with humus that is rich in nitrogen in its virgin state, and its nitrogen contents can be easily maintained and increased by the use of leguminous crops, such as peas and alfalfa, in a crop rotation."

At Elmendorf, N. M., on the Rio Grande, is a project which in future promises to be one of the best enterprises by private corporation in New Mexico. This company owns about 22,000 acres of rich valley land. During the past year this company has put under water about 2,000 acres cultivated to grain, alfalfa, etc., with an experimental plat of 50 acres to sugar beets. Like Colorado, New Mexico is perfectly adapted by soil and sunshine for sugar beet production, and a sugar factory possibly in any locality would cause a large acreage to be put in. The Socorro Company, as it is named, is working on the west side of the Rio Grande, where about 20,000 of the 22,000 acres is located.

The Farmers' Development Company, of Springer, N. M., is one of the best irrigation propositions in New Mexico. This company has made rapid headway with its construction work and it is being carried on with much energy and accomplishment. Already there are 35 families located upon this land, water being delivered to the same. An enterprising community is being started at Miami, postoffice of the new district. Public school facilities and other municipal interests are being worked up. The company sells their land upon the colonization scheme and endeavors to do much for the benefit of its settlers.

The construction of their system, reservoirs, etc., involved an outlay of some \$80,000. The main dam of the reservoir is 1,100 feet long, 200 feet wide at the base and 45 feet high. The outlet consists of a line of 30-inch vitrified pipe laid in concrete. The capacity of the reservoir is estimated at one billion gallons. The supply of this project is derived partially from Heck Arroyo, a large portion, however, comes from the Rayado River through an inlet canal $1\frac{1}{4}$ miles long, which has a capacity of 250 second feet.

The quality of soil of the land owned by the Farmers' Development Company is of the best and is common to the northern portions of the Territory. The section is adapted to the growth of fruit, grains, sugar beets, etc., in fact, the intention of this company is to push the development of this last product with the final aim of a beet sugar factory for the disposal of this crop.

The company contemplates enlarging its service by the construction of additional reservoirs. The combined capacity of the three reservoirs, as shown

by plats and field notes, is about 10,000 acre feet. This district is well supplied with coal, coke and lime rock, which makes it an ideal location for a sugar factory, as above mentioned.

The Bluewater and San Mateo valleys, comprising about 21,000 acres, owned by the Bluewater Development Company of Albuquerque, are located 107 miles west of Albuquerque, on the main line of the Santa Fe Railroad. There are two railroad stations within these valleys—Bluewater and Toltec. The soil in these valleys is exceptionally rich, being decomposed lava, mixed with loam, and is continually fertilized by wash from the limestone hills and lava beds surrounding the valleys, and their development means much to New Mexico. For stock and sheep feeding they offer an ideal combination of cheap grazing lands in the surrounding foothills and immense yields of forage crops in the valleys under irrigation.

The reservoir is located some twelve miles from the valleys and drains over 240 square miles of heavily timbered watershed with an average rainfall of approximately 18 inches. The outlet from the reservoir is by means of a tunnel approximately 400 feet long and six feet square, driven through the solid rock at one side and not connected in any way with the dam. The dam is 386 feet long and when it reaches its full height will be 100 feet above datum. The first section is already completed.

The French Land and Irrigation Company of Springer, N. M., contemplates the irrigation of 43,000 acres of land that has been acquired by this company in Colfax County. The A. T. & S. F., El Paso and Southwestern and Rocky Mountain & Pacific railways pass through or near the property and with these facilities the products raised are easily delivered and shipped to the leading markets.

The preliminary work of surveying was begun during July, 1907, and active construction commenced in November. The plans of the project contemplate the conservation of the flood waters of the Cimarron and Vermejo rivers, and the Ponil, Cerreroso and Van Brimmer creeks. This company claims, in a report to the Engineer, from which this data is taken, that the flood waters of these creeks and drainage area will afford sufficient supply for the 43,000 acres to be developed. A system of seven reservoir sites is intended, which after filling twice each season, will amount to 129,000 acre feet. The soil is rich and fertile; anything can be grown common to the temperate regions, when water is applied to the soil. Fruit, grains, alfalfa and sugar beets do exceptionally well in this locality.

The Lake Charette Reservoir and Ditch Company of Springer, N. M., seeks to appropriate the flood waters of Ocate Creek, which it is estimated during flood times affords a flow sufficient to irrigate from 18,000 to 20,000 acres of land. In planning this irrigation scheme a diversion dam 43 feet in height is provided, with a length of crest of 165 feet. This dam is to be of the over-fall type with a concrete core and earth filling, and faced in a manner as to make it thoroughly secure. The intake ditch is about $4\frac{1}{2}$ miles long, with a carrying capacity of 626 cubic feet per second.

The reservoir is ideally fitted in every way for storage purposes. It is the crater of an extinct volcano and the ages that have transpired since it was in eruption have rendered its bed and slopes impervious to water. The reservoir has an 18,000 acre feet capacity when supplemented by a masonry dyke 460 feet long and ten feet high at its highest point. The lands to be irrigated by

this project lie in Colfax and Mora counties, and have that easy slope so pleasing to the eye of the practical irrigation farmer. The land lies immediately adjacent to the Atchison, Topeka and Santa Fe Railroad, which will afford ample transportation and shipping facilities for the farmers. Total cost of this enterprise will be \$60,000.

The above listed projects are a few of the principal enterprises that have actually applied water to the land as appropriated to them within the provisions of the last law. The following, however, are propositions which have not, or at least four months ago, put the water to use upon the land. This list also includes some of the most important projects for which permits to appropriate water have not, as yet, been granted by this office.

The Taos Valley Land Company of Taos, N. M., has under its project, 15,000 acres of land in one of the most beautiful valleys in New Mexico. The climate of this place adapts it nicely to the production of fruit more particularly, but grains of all kinds and vegetables are produced in abundance. It was from this section that the first Mormons bought their seed grain for the planting of that rich section in Utah. The purpose of the Taos Valley Land Company is to plant several thousand acres in fruit trees, principally apples and pears, reserving sufficient open spaces between the trees for the cultivation of sugar beets, wheat, barley and other grains, together with the other products appertaining to intense farming, and dividing the land into small tracts of from twenty to forty acres, to suit the purchaser. The farming lands of the company are located at an altitude of from six to seven thousand feet, the soil is a rich red color, consisting of sandy loam and volcanic ash to a depth of from three to six feet, with a clay subsoil. The project consists largely of the combining of several small ditches into one system.

The largest underflow project in the territory is the one contemplated by James M. Gaar, of Deming, N. M. This proposition is located in the Mimbres Valley about 15 miles east of Deming, N. M., adjacent to the Southern Pacific, Rock Island and A. T. & S. F. and will reclaim, by the development of the underflow, as many acres as possible of the best land in this section. The water supply is secured from Florida Lake which gives its name to the project. This lake covers about 1,500 acres of land. Experimental wells show the presence of an enormous quantity of water which can be developed and utilized for irrigation. The water supply will be developed by dredging a large part of this basin and a storage reservoir created by the construction of a sub-surface dam. The products of this region, which are common to the temperate zone, are shipped by the fine railroad facilities into Arizona, Texas and New Mexico. The land is a rich sandy loam varying from eight to 15 feet in depth and lies so ideal that practically no levelling is required. Altitude of this section is 4,200 feet and climate is typical of New Mexico. Water of the Mimbres is exceptionally free from impurities.

Geo. H. Webster, Jr., of Cimarron, N. M., general manager of the Uracca Ranch Company, a private enterprise, is now constructing an irrigation project which is probably the largest single-handed proposition in the territory. This proposition would probably not appear large to an irrigation company but undoubtedly is quite an effort for private investment.

Mr. Webster is now constructing his reservoir for the impounding of the flood waters of the Cimarroncito, water being conveyed one-half mile through

an inlet canal to the reservoir. By the construction of a storage dam some 50 feet high and 600 feet long, this water will be held until it is needed for irrigation on the lands within the borders of the Uracca ranch.

On the Rio Puerco west of Albuquerque, the Rio Puerco Irrigation Company of Albuquerque has a project which a number of years ago was started with a large expenditure of money, but was washed away by a very disastrous flood of that time. It is now, however, ready to commence new construction work on their project. This project contemplates the irrigation of 19,000 acres of land in the Bernabe de Mantano Grant.

On the western side of the territory in the vicinity of Gallup, N. M., the Defiance Reservoir Company is working up a proposition to irrigate some 19,000 acres from the drainage area of the Rio Puerco of the West. The principal feature of this proposition is the construction of a storage reservoir, storing water from this river, capacity of same being about 20,000 acre feet. This proposition is in a locality where there has practically been no irrigation development. The mining interests in this section are very extensive, maintaining a good market for any agricultural products that may be raised under this proposition.

John G. Gage and John B. Enfield of Artesia own the project, the development of which has been undertaken by the Oasis Development Company. This proposition is in the Sacramento Valley in Otero County, taking most of its water supply from the stream of that name. Owing to the torrential character of this stream, a storage scheme is necessary. A canal diverts this flood water several miles to a reservoir site out on the plains where same is stored for irrigation of a large tract of government land, located in a portion of the territory where there has been no previous development. Cost of this project is estimated at \$76,000.

Charles Springer of Cimarron, N. M., owns probably the majority of the projects in Colfax County. Some of the most important storage projects in New Mexico are the Cimarron, Ponil and Vermejo reservoir enterprises. The topographical features of these reservoir sites are practically ideal and are of such extent that large capacities can be secured on account of the location at such a high altitude as these reservoirs are usually located, in the mountains where the evaporation is less and the rainfall is greatest. It is the opinion of the writer that if the greatest possible duty of water is desired, same can be better obtained by the application of the water to lands near its source, thereby conserving the water best on its first use and permitting the use of the return waters several times over.

Probably the best known of Mr. Springer's projects is the "Eagle's Nest" which has probably the most ideal natural facilities for a reservoir site in New Mexico. This almost perfect reservoir is formed by the Cimarron River passing into a natural basin surrounded on all sides by high mountains. Undoubtedly at one time this formed a lake but gradually the river worked its way out, cutting a steep narrow canyon across which it is planned to erect a dam closing this basin up, making a lake as originally formed. This dam will be 130 feet high and will impound 113,700 acre feet for the irrigation of 65,000 acres at a cost of \$100,000.

The Eden Land & Power Company with headquarters at Aztec, N. M., is now, at this writing, making active preparations for the carrying out of its project. Heretofore money has been somewhat scarce owing to the financial

stringency but now that election is over this company has secured the necessary funds and the project will go forward with rapidity. The engineering feature of this project is rather difficult but under the supervision of Geo. G. Anderson, C. E., of Denver, Colo., and Blair Burwell, C. E., of Durango, Colo., consulting engineer, this will be overcome with the best of engineering skill. The intake is on the Las Animas River in Colorado, a stream which has its head in the mountains 14,000 feet in height and is, therefore, fed by almost perpetual snow, the source of supply being exceptionally steady and certain. In "Water Supply" of this report will be found the discharge of this stream supplying water for the irrigation of 30,000 acres at a cost of \$500,000. The main canal of this company is 35 miles long and together with two other canals of ten and 15 miles each will carry about 300 feet per second.

Another important feature of this project is the production of power by utilizing a drop of 50 feet occurring in its system. The estimated amount that can be generated is 400 horse-power, and with the addition of \$20,000 the capacity of the ditch can be increased, thereby increasing the horse-power to some 3000. It is the aim of the company to furnish electricity for domestic purposes to present and future towns. Practically all the land under the Eden Canal has been signed up and the dirt will fly before the first of the year.

The Turley-Hollister proposition, located in San Juan County, derives its water supply from the San Juan River. This is the largest proposition that has ever been undertaken in the United States and much credit should be given to Jay Turley, C. E., in bringing this proposition to the position where capital has become interested.

The discharge of the San Juan River for 1907 according to records in the Territorial Engineer's Office was 1,475,855 acre feet. At the intake of the canal there is proposed a reservoir with a capacity of over 1,000,000 acre feet. The alignment of the canal is very good and, with the exception of a short distance near the intake, there is but little heavy construction. The land covered by this proposition lies south of the San Juan River and with the exception of about 5,000 acres is government land. A large portion, however, lies within the boundaries of the Navajo Indian Reservation.

The character of the soil is ideal for irrigation, the land lying largely in sloping mesas with arroyos at convenient intervals for drainage. The soil varies in density in different localities but the surface is never heavier than a loam. The mesas are of a characteristic reddish color and show a loam to clay loam with a sandy surface underlaid with a heavier soil. This is an ideal condition for the conservation of moisture, and a high duty of water. The altitude of this body of land varies from about 5,000 to 5,800 feet. The temperature seldom falls below zero and the daily range is not great. The precipitation falls principally during the summer months which makes it possible to raise a light crop in favored spots at the present time without irrigation. The climatic conditions and soil make it adapted to the production of a great many crops including cereals, legumes and fruit. Owing to the topographical conditions of these mesas late killing frosts in the spring of the year are unknown, thus making this section particularly adapted to the fruit industry. The San Juan apple is to be found in the fancy markets of Chicago, which has caused this section to be known as the land of the "Big Red Apple."

In addition to the above project, Turley and Hollister have another proposition already approved by this office, on the north and west side of the Animas



River in San Juan County. They propose to irrigate about 130,000 acres of land in New Mexico. This proposition can be extended to cover about 700,000 acres if the water is available. The natural conditions of this proposition are similar to those on the San Juan. These two propositions will bring under irrigation and cultivation some of the most fertile lands in New Mexico.

The Red River Land & Water Company is located in Taos County, deriving its water supply from the Red River. This project itself is located about 25 miles north of Taos and about 15 miles to the south of Coltila. The project contemplates the irrigation of 50,000 acres, 30,000 of which is territorial land which the company is under contract to irrigate. The remainder of 20,000 is made up of public and private land. The altitude of the land is about 7,000 feet but apples, pears and plums have been raised in this district with marked success.

Palo Blanco Irrigation Company is another of the most important private enterprises in the territory. Although this proposition is not the largest in size, it will easily irrigate about 8,000 acres of fertile land in Colfax and Union Counties. It is claimed that the run-off of the Palo Blanco Creek affords a constant flow in the stream and during flood times the volume is sufficient, as estimated by their engineers, if properly stored, to irrigate from 12,000 to 15,000 acres. Two dams are required, the first one across Palo Blanco Creek 885 feet long and 58 feet high at its greatest height, the other 1,700 feet long and with a height of 48.6 feet. The capacity of the reservoir is 7,500 acre feet of water. Work on these dams was started last fall.

Community Projects

Besides all of the above projects there are a number of propositions throughout the territory that are now operated or contemplated, along the main river systems, that are carried out on the community plan. Communities composed of farmers on desert claims band together to construct irrigation works to irrigate their land and form a company for the construction of same. These systems are controlled or governed in a similar way to the old acequias and community ditches built by the earlier settlers, as the cost of maintenance is borne according to the holdings each farmer has under the ditch. One or two such systems are given herewith:

The Citizens Ditch and Irrigating Company of Aztec, New Mexico, is a community proposition which is now constructing a canal to reclaim some 7,000 acres of choice fruit land in San Juan County. The intake of the canal is on the San Juan River near Blanco. Work is now being done on this project.

Young & Norton of Fruitland, New Mexico, contemplate the irrigation of 5,000 acres or more of some of the best land in New Mexico. The land so designated is called "The Meadows" and is located in the western part of San Juan County. The water source of this project is from the La Plata River and the water is diverted from the river by a ditch to a natural storage reservoir of some 12,000 acre feet capacity. All the land under this project has been taken by squatters pending the survey of the townships. The land formerly came under a proposed project of the United States Reclamation Service in connection with its Animas-La Plata Project but was relinquished and thrown open to entry on the first day of September, 1907, and was rapidly settled up by a progressive community.

The lower Animas Ditch Association of Aztec, New Mexico, is a community

proposition extending the present Animas ditch and reclaiming about 1,700 acres owned by the members of the Association. The major portion of this extension is now completed, there being considerable tunnelling in its construction. The Animas Ditch itself covers about 2,500 acres and is one of the oldest ditches in San Juan County. This also is a community system.

Small Projects

The following briefly described projects are only a small part of the list of individual projects having a small acreage. These are given herewith to partially represent the growth of the small projects as well as the larger ones above described.

T. E. Mitchell, of Albert, New Mexico, has quite a large project in Union County. The water supplying the project is diverted from Tequesquite and Carrizo Creeks by means of three ditches which cover several thousand acres, some of which can be supplied, if necessary, from the underflow, of which there is considerable. This is one of the largest projects in Union County and will be of great benefit to that section.

The Wylie Farm & Live Stock Company, of Roswell, New Mexico, has installed a pumping plant raising water 18 feet from the Pecos River and irrigates 700 to 1,500 acres of which most has heretofore been waste land.

Fred J. Lukins of Artesia, New Mexico, has a novel system of drain ditches connecting with other farmers and ridding his and their land from swampy places and then using the water for irrigation. The land so drained is drying out and will in time be of value.

For a small project of 160 acres that of J. J. May of Hillsboro, New Mexico, will probably rank among the best with regard to intense cultivation and economical use of water. Mr. May now has about one-half in cultivation, planted to fruit, corn, potatoes, etc.

L. E. Martin of Alamogordo, New Mexico, is irrigating his homestead from La Luz Creek, supplementing this with careful cultivation and preserving the moisture in the soil. This claim was once an old Mexican farm and the silt deposited there through irrigation has made it a rich black, sandy, loam soil.

The ditch of Julia F. Morgan of Alamogordo, N. M., takes water from the San Andreas Canyon above the point where same has previously sunk and was lost. This project makes the best use of opportunities at hand and offers an example of using waters heretofore considered insufficient and unimportant.

J. A. Cottingham, whose address is Roswell, New Mexico, with his water appropriation from Lake Francis will eventually reclaim his land by the appropriation of water heretofore unused for irrigation purposes. This ditch is owned by three or four other settlers and together they will devote same to the production of corn, oats, etc.

There are numerous small projects in the territory, many of which are now by this time under cultivation, but time and space prevent the further description of this line of progress in the territory.

United States Reclamation Projects.

The Reclamation Service has five projects under consideration, two of these have been waiting for some time on account of lack of funds. The Las Vegas, which is one of these, contemplates the irrigation of 10,000 acres near

Las Vegas, New Mexico, and the other, the Urton Lake, covers 60,000 acres north of Roswell, New Mexico. The Hondo will eventually reclaim 10,000 acres and the Carlsbad Project has practically irrigated from 12,000 to 20,000 acres. This latter project was formerly owned by the Pecos Irrigation Company, from which it was purchased by the United States Government and \$600,000 has been spent on this project. The farmers under this proposition are prosperous and contented. The largest project, the Elephant Butte or Engle, is to reclaim 110,000 acres in New Mexico. Preliminary work has already been in operation for the past few months. This proposition embraces the largest artificial lake in the world and will cost \$7,200,000. At Leasburg, a part of this system now in operation, \$200,000 has already been spent.

Board of Water Commissioners

The Territorial Board of Water Commissioners, created under the Act of 1907, has filled an important place in the affairs of the Department of Irrigation. This body, consisting of three members who act as a judiciary body upon appeals from the decision of the Territorial Engineer upon water right applications, convenes every three months and goes over the ground of the appeals, generally in a legal capacity, and hears oral arguments brought before it, through the attorneys of the respective defendants and appellants.

One object obtained by the Board in this capacity is that quick action and service may be obtained upon questions arising under the Territorial Engineer. Should the parties interested be adverse to the verdict returned by the Board either confirming or reversing the acts or decision of the Territorial Engineer, an appeal may then be taken to the District Court where final judgment is secured.

The Board since its creation, March 19, 1907, has convened and held regular meetings on the first Mondays of May, August, November, 1907, and February, August and November, 1908.

The first meeting of the Board in May, 1907, was called for the purpose of organizing and other routine work of its department. Mr. Charles Springer of Cimarron, New Mexico, was elected president and Mr. Malaquias Martinez of Taos, secretary; the other member of the Board being Mr. O. C. Snow of Mesilla Park.

In November, 1907, the first appeal was heard by the Board, that being upon the approval of the Engineer of the application of the Farmer's Development Company of Springer, New Mexico, for water from the Rayado River in Colfax County. The action of the Board in this particular case was to revise the Engineer's approval to conform to a stipulation entered into by the appellants and the Development Company, and to extend the time for beneficial use of the water.

The important case of the El Paso and Rock Island Railroad Company to change its point of diversion on the south fork of the Bonito Creek in Lincoln County was taken up at the February meeting in 1908 for consideration. The action of the Board was to confirm the decision of the Territorial Engineer. The case has later been appealed to the District Court but owing to the prosecution of a hydrographic survey of the Hondo stream system, of which the Rio Bonito is a part, action by the court has been withheld. Mr. Venceslao Jaramillo of El Rito succeeded Mr. Martinez at this meeting. The

usual routine business was transacted by the Board as at the previous meetings, after which it adjourned.

The appeal of Judge A. J. Abbott, representing the Pueblo de Taos (Indians) from the decision of the Engineer approving applications Nos. 125 and 126 of the Taos Valley Land Company for permits to appropriate water from the Arroyo Seco and Rio Hondo in Taos County constituted a part of the business before the Board at the August meeting. After hearing oral argument by the attorneys representing the parties to the appeal and after careful examination of the papers filed with the engineer, the Board considered the grounds insufficient for appeal and the case was ordered dismissed. The action of the Board has been appealed by the Pueblo de Taos to the District Court.

The November meeting of the Board was postponed from the first Monday to the 30th of the month. The appeals brought before the Board at this time were three in number and probably the most important that have been brought into its jurisdiction.

The appeal of Furman & Burke of Farmington, N. M., against the approval of the Turley-Hollister Project in San Juan County was considered and dismissed.

Owing to the incomplete attendance at the Board meeting, the appeals of E. O. Dean, et al., vs. Fred Vanderwork and M. C. Hinderlider vs. Young & Norton were postponed to a specially called meeting for Jan. 13th, 1909. Evidence however, was heard by the Board from representatives in both appeals. The appeal of Mr. M. C. Hinderlider will be heard in Farmington in January owing to the number of witnesses to be heard.

Viewing the last year and a half's work of the Board, it appears very satisfactory and the importance of such a Board in the administration of territorial waters has become strongly apparent.

Good Roads

One of the essential features for the development of a new country is a means of easy access to same, and while the development of the territory has been phenomenal the past few years, it has been largely due to its natural resources.

It has been the object of this department not to follow in the wake of development, but rather to be one of its agents in assisting its advancement.

The need and the benefits to be derived from good roads are so well known that we will not mention those points; however, the condition existing in the territory is not so much the need of legislation in short cross roads, if our present laws were carried out, as the need of more good roads to connect the different cities and villages.

We are fortunate in having conditions most favorable for cheap construction of roads, as we have good material for road construction and our climatic conditions are most favorable for a cheap maintenance.

The cost of construction of good roads depends a great deal on the location of such road and the systematizing of the work in construction to suit the natural conditions.

Developing of Irrigation and Dry Farming

The time has come when not only the individual farmer but the whole public begins to see the value and necessity of proper handling of water and

soil in irrigation and dry farming. New Mexico is favored with the best climate in the world and is abundantly supplied with the most fertile soil, and our only limit in irrigation farming is controlled by the water supply and the extent to which we are able to make our supply of water cover. This last condition is practically controlled by the water user himself.

Today, the beneficial result obtained from the amount of water being used is less than thirty per cent of what it should be or is about ten per cent of the duty received in California. Even in our territory some irrigators are gaining five hundred per cent better results from a given quantity of water than others. May I ask the cause for this marked difference of the one over the other? It is simply on account of the lack of general knowledge of the one of how and when to irrigate, how to care for the soil and crops and what kind of crops are suited to the natural conditions. The same conditions as to conservation of moisture, care of soil and kind of crops to raise, arise under dry farming as well as irrigation farming.

The question then arises what is the best way to assist our farming people to obtain better results. Of course the individual himself is anxious to do as well as possible, but oft times he is unable from various causes to experiment and observe the results.

New Mexico will ultimately irrigate 2,000,000 acres of land and there is approximately 10,000,000 acres where the rainfall is generally sufficient and the soil suitable for dry farming of which the territory owns over 2,000,000 acres. With such agricultural resources and the prospects of statehood, it is apparent that the time is approaching when New Mexico should take the lead in the developing of irrigation and dry farming.

In order to obtain the development desired with any degree of success and speed, it will be necessary for the territory to do all in its power to assist the farming class in learning proper methods by which to care for the soil and water and the kind of crops best paying and best suited for local conditions. The most optimistic person cannot hope to make a success of agricultural pursuits if he pursue the ordinary methods of farming and many of the farmers now coming into the territory without the proper guidance, will make failures where successes ought to be, especially in the dry farming districts.

Development of the Underflow

It is the intention of this department to publish for distribution a bulletin on the underflow possibilities in different valleys in the territory. This office has been looking into the underflow supply for the past few months and data has been slowly collected when the duties of the engineer and the opportunity would permit.

The geological formation or stratification of New Mexico is more or less broken up thereby admitting a considerable amount of surface waters to sink into the underground passages. This fact is illustrated very strikingly in the extensive artesian belt in the eastern part of the territory and within recent months another artesian district has been discovered about 100 miles east of Albuquerque. We also believe that from the disappearance of the rainfall in the area surrounding and comprising the Estancia Valley much could be done in underflow development in that section. The same conditions exist in what are known as the Alamogordo and Mimbres Valleys. In these valleys there are

streams flowing towards the valleys which disappear entirely and doubtless go into the underflow. In the dry farming districts especially the systematic use of underground waters will be of inestimable value.

The Carey Act

It has been the earnest desire of this department to have the provisions of the Carey Act extended to the territory and at the present time there is a bill pending in Congress extending the provisions to the territories of New Mexico and Arizona. In addition to the possibilities of getting the provisions of the Act extended to New Mexico in this way, there is the probability of the Territory's becoming a state and in such a case the provisions would then become applicable to New Mexico.

If we are successful in this matter it will assist in bringing about several large irrigation projects and in that event it would be quite necessary that the Territory have some appropriation for the classification of lands that would come under these irrigation projects and also there are numerous reservoir sites that should be investigated.

Although quite well known, it might not be out of place to briefly outline the intent of the Act above mentioned. This Act of Congress gives to the semi-arid or arid states a million acres of land by the Federal Government. The states then through the Legislatures enact and pass laws to carry out the provisions of the Act. The laws generally provide for a charge of fifty cents an acre by the state for the handling of the business connected with the lands. The land is then segregated under the best irrigation projects by the state and is then held for the cost of construction of the irrigation works by private individuals who do this work under the supervision of the State Land Board and the State Engineer. The farm unit under these projects is 160 acres although quite frequently in many of the states the limit is placed at 80 acres. In this way the individual settler or land owner has to pay only fifty cents to the state plus the cost of the water right per acre to the irrigation company.—1st Biennial Report of Terr. Eng. to Gov. of New Mexico.

Applications for Irrigation Water Rights Filed since May 13, 1907, which have been Approved or are Pending.

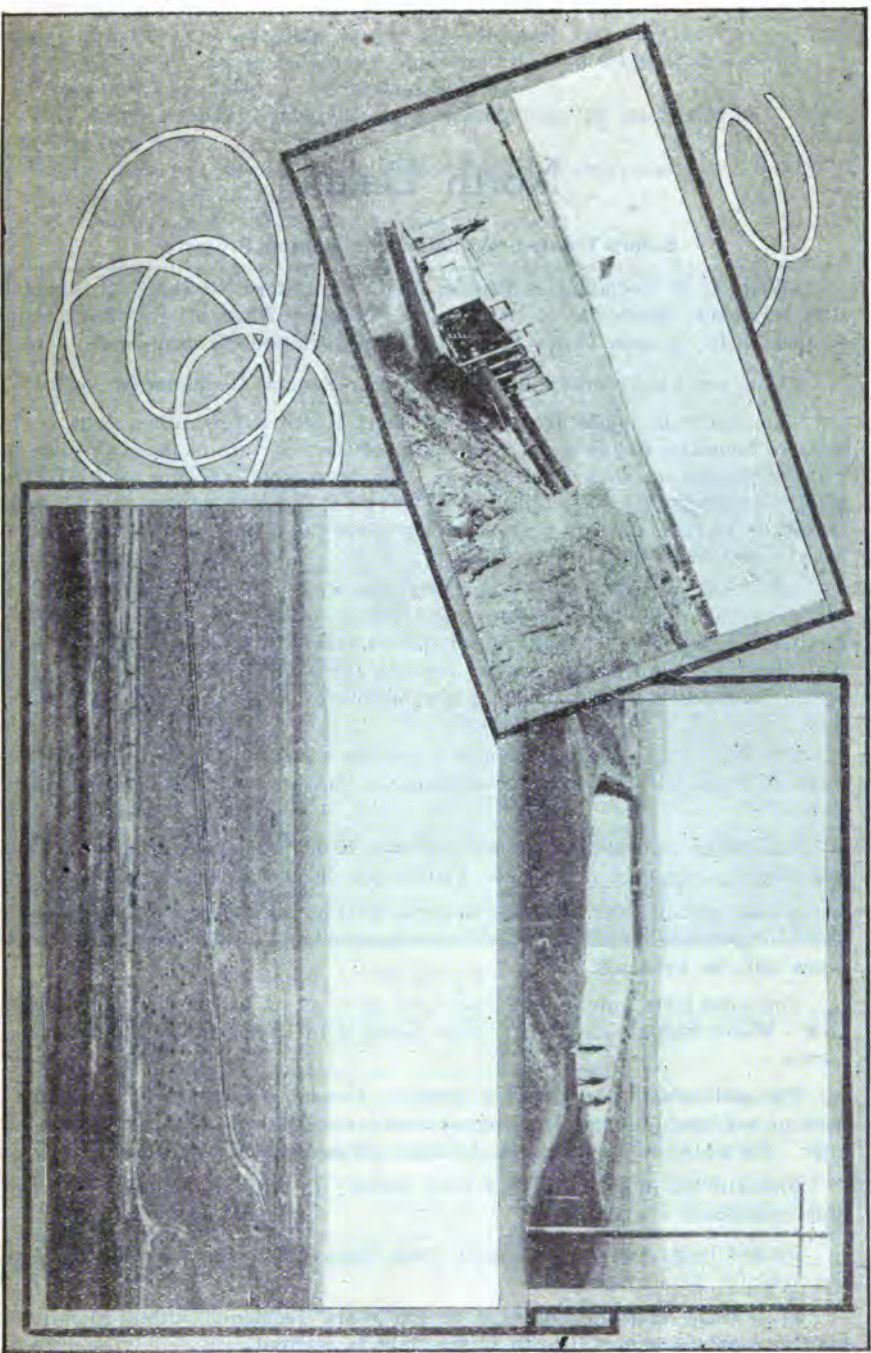
| Name of Applicant | Source of Appropriation | Use | Acres to be Irrigated | Disposition |
|--|---|------------|-----------------------|-------------------------|
| Monte Alto Irrigation Company | Dickey Canon | Irrigation | 1,000 | Approved Dec. 9, 1907 |
| Rayado Land and Irrigation Co. | Rayado River, Canyada Arroyo, Moro Creek, Mequina Creek | Irrigation | 7,500 | Pending |
| Jesse J. May | Trudillo Creek | Irrigation | 200 | Approved Aug. 23, 1907 |
| John C. Gage and John E. Enfield by Will Benson. | Sacramento River | Irrigation | 30,000 | Approved Jan. 11, 1907 |
| Eden Canal and Power Company | Animas | Irrigation | 60,000 | Approved Dec. 4, 1908 |
| Charles Springer | Vermelo River | Irrigation | 8,000 | Approved Sept. 4, 1907 |
| Charles Springer | South Ponil Creek | Irrigation | 2,800 | Approved Sept. 24, 1907 |
| Edward D. Brown and Dove Brown | Rito de la Plana | Irrigation | 7,000 | Approved Oct. 14, 1907 |
| Citizens Ditch & Irrigating Co. | San Juan River | Irrigation | 18,400 | Approved Feb. 14, 1908 |
| Palo Blanco Land & Irrigation Co. | Palo Blanco Creek | Irrigation | 1,000 | Approved April 7, 1908 |
| Emilio Valdez | Sweetwater Creek | Irrigation | 640 | Pending |
| D. R. Hartley | Blue River Spring | Irrigation | 1,000 | In litigation |
| Alamogordo Improvement Co. | Caballero Springs | Irrigation | 1,000 | Approved Dec. 10, 1907 |
| Alamogordo Imp. Co., by W. R. Eidson, V. P. | La Luz and Fresnal Canon | Irrigation | 1,040 | Approved Dec. 14, 1907 |
| Geo. H. Webster, Jr. | Cimarronetto Creek | Irrigation | 100 | Approved Jan. 13, 1908 |
| T. Banks | Felix River | Irrigation | 400 | Approved Feb. 14, 1908 |
| Oscar W. McCuiston | Dry Cimarron | Irrigation | 10,000 | Pending |
| Farmers Development Co. | Rayado River (South Fork) | Irrigation | 10,000 | Approved April 28, 1908 |
| Farmers Development Co., per M. N. Mikesell, G. M. | South Fork Rayado River | Irrigation | 3,280 | Approved April 3, 1908 |
| Charles W. Thurlinger | Animas River | Irrigation | 63,000 | Approved July 29, 1907 |
| Charles Springer | Cimarron Creek and Tributaries, Cleugilla, Moreno, etc. | Power | 800 | Approved Oct. 29, 1907 |
| J. C. Dunn, Milton Phillip, H. A. Morgan, C. W. Morgau | Dry Canon and Torrential waters of Red Arroyo | Irrigation | 680 | Approved March 16, 1908 |
| The Rito de la Lama Irrigation Co. | Rito de la Lama | Irrigation | 1,504 | Approved April 18, 1908 |
| Cabresto Lake Irrigation Co. | Cabresto Lake and Creek | Irrigation | 19,200 | Approved July 21, 1908 |
| Rio Puerto Irrigation Co. | Rio Puerto | Irrigation | 2,000 | Pending |
| Chas. Springer & Co. | Springs and lands Agua Fria Fork | Power | 7,000 | Pending |
| R. H. Bailey and other citizens and water users | Rio Grande | Irrigation | 21,000 | Approved March 17, 1908 |
| French Land and Irrigation Co. | Ponil Creek | Irrigation | 21,000 | Approved March 17, 1908 |
| French Land and Irrigation Co. | Cimarron | Irrigation | 21,000 | Approved March 17, 1908 |
| French Land and Irrigation Co. | Carososo Creek | Irrigation | 21,000 | Approved March 17, 1908 |
| Merrill H. Fisher | Headwaters Alamo and Caballero Creeks | Power | 3,320 | Pending |
| D. N. Hartley | Pinabetas | Irrigation | 3,000 | Approved March 23, 1908 |
| Cerro La Association de Mutua Beneficio y Mutua Protection | Rito Later | Irrigation | 3,000 | Approved Feb. 19, 1908 |
| William H. Lambert | Tenaja Creek | Irrigation | 840 | Approved Feb. 23, 1908 |
| Jay Turley and H. L. Hollister | Florida River | Irrigation | 130,000 | Approved July 21, 1908 |
| William H. Lambert | Eagle Tail Mesa Creek | Irrigation | 250 | Approved Feb. 23, 1908 |

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|---|--|------------------|----------------|--------------------|----------|
| James D. Hand | Mora River | Irrigation | 1,220 to 1,500 | Pending | |
| Placita Ranch Co. | Apello River | Irrigation | 8,000 | Pending | |
| Chas. Springer & Co. | Chimarron and Chimarroncito River | Irrigation | 2,680 | Pending | |
| Chas. Carter, James W. Hale, Henry B. Rasmussen. | La Plata and Living Springs | Irrigation | 1,520 | Approved May | 2, 1905 |
| Red River Land and Water Co. | Red River | Irrigation | 45,000 | Pending | |
| Jay Turley and H. L. Hollister | La Plata River | Irrigation | 30,000 | Approved July | 21, 1908 |
| Wm. Meador (for the Nebraska Reservoir) | The Sugarite | Irrigation | 320 | Pending | |
| C. L. Hortenstein and C. E. Hartley | Ogallala River | Irrigation | 10,000 | Approved Feb. | 4, 1908 |
| Clyde C. Wilkse | La Plata River | Irrigation | 53 | Approved May | 2, 1908 |
| J. P. Annan | Dog Canon Springs | Power | 1,000 | Approved April | 7, 1908 |
| George Carl | Copple Creek | Power | 1,000 | Approved July | 1, 1908 |
| John D. Young and George N. Norton | Merchecce Springs | Power | 5,000 | Approved May | 29, 1908 |
| W. A. Williams | Rio Galisteo | Irrigation | 920 | Approved July | 20, 1908 |
| The French Land and Irrigation Co. | Van Buren Creek | Irrigation | 30,100 | Approved May | 20, 1908 |
| The French Land and Irrigation Co. | Vernon River | Irrigation | 30,100 | Approved July | 21, 1908 |
| James A. Cottingham, Mathew L. Cottingham and Hannah S. Rose | Lake Francis | Irrigation | 640 | Approved March | 20, 1908 |
| James A. Gregory | Alamosito Arroyo | Irrigation | 230 | Approved Aug. | 1, 1908 |
| Sefedina y de Canchez | Two arroyos (un-named) | Irrigation | 288 | Pending | |
| Isis A. Sanchez | An arroyo (un-named) | Irrigation | 135 | Approved Sept. | 24, 1908 |
| John J. Brophy | Sierra Canon | Irrigation | 140 | Approved July | 22, 1908 |
| T. E. Eichel | Pecos River and Delaware Creek | Irrigation | 15,000 | Lost by default | |
| J. E. Martin, N. W. Almon, W. M. McAnnis, Grey McAnnis, T. A. Hilburn, B. L. Hilburn, J. R. New | La Luz Creek | Irrigation | 980 | Approved Oct. | 19, 1908 |
| Blanche I. Major | Spring Lake | Irrigation | 120 | Approved March | 21, 1908 |
| Citizens Ditch Co. (E. S. Redding, Pres.) | Rio Colorado | Irrigation | 800 | Approved Jan. | 22, 1908 |
| Eugene V. Patten | Raple Grove Canon, Ice Canon | Irrigation | 25 | Failed to Complete | |
| John H. Culley | Rain water from hills | Watering stock | ..... | Approved March | 16, 1908 |
| Chas. E. Blattman | Ocate River | Watering stock | ..... | Approved April | 28, 1908 |
| J. J. Gross | Arroyo (not named) | Irrigation | 230 | Approved May | 20, 1908 |
| Taos Valley Land Co. | Rio Lucero | Irrigation | 5,000 | Pending | |
| Taos Valley Land Co. | Rio Honda | Power-Irrigation | 10,000 | Approved April | 21, 1908 |
| Taos Valley Land Co. | Arroyo Seco | Power-Irrigation | 5,000 | Approved April | 21, 1908 |
| John G. Stewart | Marble and Stewart Canons | Irrigation | 60 | Approved March | 18, 1908 |
| Fred J. Lukins | From a draw ditch | Irrigation | 140 | Approved April | 28, 1908 |
| William E. Rogers | La Luz Creek | Irrigation | 320 | Approved July | 23, 1908 |
| Edward T. Baird | Cottonwood draw | Irrigation | 180 | Approved April | 23, 1908 |
| W. A. Coe | La Luz Creek | Irrigation | 60 | Approved Sept. | 4, 1908 |
| H. B. Jones | Agua Negra Chiquita | Irrigation | 800 | Approved July | 23, 1908 |
| Wm. H. Lambert | Tenaja Creek | Power-Irrigation | 1,300 | Pending | |
| Antonio J. Ortiz | Rio San Antonio and Arroyo San Antonio | Irrigation | 840 | Approved Feb. | 25, 1908 |
| F. D. Albright and W. O. Albright | San Andreas Canon | Irrigation | 200 | Pending | |
| H. M. Lettis | Crow, Little Crow and Prairie Creeks | Power | | Approved Aug. | 1, 1908 |
| | | Irrigation | 5,000 | Withdrawn | |

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| S. C. Hawthorne | Arroyo Hondo | Irrigation | 5,000 | Withdrawn | |
| Oliver M. Lee | Kid Bluff Spring and groups of springs in Grape Vine Canon | Irrigation | 160 | Approved Aug. | 10, 1908 |
| Oliver M. Lee | Scott Able Canon and Sacramento River | Power | | Approved Aug. | 10, 1908 |
| Oliver M. Lee | Sacramento Ditch Lee pipe Line | Power | 33,920 | Approved Aug. | 10, 1908 |
| J. C. Roseborough | Mimbres Canon and Springs | Irrigation | 320 | Approved May | 29, 1908 |
| Julia F. Morgan | Pecos River Canon | Agricultural | 717 | Pending | |
| Wylie Farm & L. S. Co. | Mule Spread Canon | Irrigation | 5,440 | Pending | |
| O. M. Lee, C. E. Mitchell, J. L. Lawson | N. Fork, S. Fork, M. Fork Ruidoso Cedar, Carizo Creeks and Ruidoso River | Power | | Pending | |
| Clinto N. Cotton, John D. Bland, S. E. Wood, R. B. Langan, J. W. Rains, Reese Beddow, F. C. Leigh, C. A. Carrington, John Arms, H. C. Shultz, J. N. Benson, W. D. McKluney | Watershed of Defiance Canon and Rio Puerco | Irrigation | 19,000 | Pending | |
| II. W. Wolcott | Sacramento River | Power-Irrigation | Dependent on amt. of seepage water saved | Failed to Complete | |
| L. B. Furman and R. E. Burke | Animas River | Irrigation | 80,000 | Rejected | |
| E. Krause and W. E. Fletcher | Penasco River | Power | 9,880 | Approved Aug. | 10, 1908 |
| James M. Gaar | Mimbres | Irrigation | 320 | Approved Sept. | 4, 1908 |
| Frances McDonald | Carlizo Creek | Irrigation | 103 | Approved Aug. | 5, 1908 |
| Fred Vanderwork | Vanderwork Ditch and Reservoir | Irrigation | 500 | Approved Sept. | 4, 1908 |
| Guadalupe Miera and Onofre Akers | Rio Puerco | Irrigation | 22,000 | Pending | |
| The Vermejo Ditch Co. | Salt Peter Creek | Irrigation | 240 | Pending | |
| Luman H. McNett | Apache Telo Springs | Irrigation | 160 | Pending | |
| M. B. May | Tortilla Creek | Irrigation | 15,000 | Approved Sept. | 4, 1908 |
| II. M. Lettis | Cow Creek and tributaries | Irrigation | 240 | Approved Aug. | 1, 1908 |
| Wm. Dooley and Denis Dooley | Cottonwood draw | Irrigation | 80 | Pending | |
| Merrill H. Fisher | Robinson's Springs | Power | 1,680 | Approved Aug. | 1, 1908 |
| Geo W. Cox | Waste waters Alamo Water Wks. | Irrigation | 80 | Approved Aug. | 1, 1908 |
| J. P. Crutsinger, S. Price, A. J. Buck | North Arm of La Luz Creek | Irrigation | 210 | Approved July | 23, 1908 |
| H. P. Cameron | Mimbres River | Irrigation | 1,225,100 | Rejected | |
| Emma S. Kilburn | San Juan River | Irrigation | | Withdrawn | |
| Jay Turley | Rio Penasco | Power | | Pending | |
| J. D. Edgington | Canada de Montoya | Watering stock, etc. | | Pending | |
| J. Damian Duran | Pecos River | Irrigation | None | Pending | |
| Ft. Sumner and Pecos Land Co. | Animas River | Irrigation | 639 | Pending | |
| F. D. Crandall for self and associates | Torreon Arroyo or Draw | Irrigation | 1,700 | Approved Oct. | 15, 1908 |
| R. L. Porter and John W. Porter | South Fork of Manzano Creek | Irrigation | 178.6 | Approved Sept. | 24, 1908 |
| Sam R. Edwards | Chal's Lakes | Irrigation | 360 | Approved Sept. | 4, 1908 |
| D. E. Britt | | Irrigation | 240 | Pending | |

| W. Elmer Sperry | Holkeo Creek | Irrigation | 200 | Approved Sept. | 24, 1908 |
|--|---|------------------|-----------|----------------|----------|
| C. H. Bond and W. R. Martin | Ute Creek | Irrigation | 140 | Approved Sept. | 25, 1908 |
| W. E. Washington | Grapevine Creek | Irrigation | 540 | Pending | |
| Daniel J. Spilane | Arroyo Hondo | Irrigation | 5,000 | Approved Oct. | 12, 1908 |
| The Aztec Ditch, M. J. Field, Sec. | Animas River | Irrigation | 2,200 | Approved Sept. | 24, 1908 |
| Louis Clausing, Executor of the Frederick Roth Estate | | | | | |
| Milton Spencer Lee | Tenaja Creek | Irrigation | 620 | | |
| Ventura Gallegas | Eagle Draw | Irrigation | 220 | | |
| Herbert W. Wolcott and J. J. Lawson | Grapevine Canon and Watershed | Irrigation | 70 | | |
| Hagerman Irrigation Co. | Miller Drain Ditch | Power-Irrigation | 2,000 | | |
| L. D. Pointer, Vida Weborg, John Stocks, R. F. Cooper, W. R. Zufeldt | San Juan River | Irrigation | | | |
| Fred H. Miller | Pecos River | Irrigation | 1,200 | | |
| John W. Glidden | Canadian or Red River | Irrigation | 800 | | |
| F. T. Sumner and Pecos Land Co. | Pecos River | Irrigation | 238.3 | | |
| Wm. H. Harris | Palo Blanco and Holkeo Creeks | Irrigation | 1,432 | | |
| Hugh F. Duval | Santa Fe River | Irrigation | 13,000 | | |
| A. M. Jackley and Geo. T. Kemple | Dog Canon, (Good waters and surplus waters) | Irrigation | 600 | | |
| Herbert W. Wolcott and J. L. Lawson | Sacramento River watershed | Irrigation | 500 | | |
| Rasca Development Co. | San Mateo Creek | Power-Irrigation | 20,000 | | |
| W. T. Wells | Headwaters of San Andrews, Arroyo Canon and surface waters. | Irrigation | 6,000 | | |
| W. W. Jernigan | Chevo Canon | Irrigation | 640 | | |
| Cat-Claw Canal Co. | Cat-Claw draw and watershed | Irrigation | 105 | | |
| Lavinia DeSmet and Martin DeSmet | Chico Creek | Irrigation | 4,000 | | |
| Sacramento Valley Irrigation Co. | Sacramento and watershed | Irrigation | 480 | | |
| G. W. Pritchard and J. W. Reynolds | Santa Fe Creek | Irrigation-Power | 100,000 | | |
| The Ute Creek Ranch Co. | Ute Creek | Irrigation | 18,000 | | |
| Frank M. Quinn | Las Animas River | Irrigation | 940 | | |
| Isa Turley | San Juan River | Irrigation | 640 | | |
| Thos. McMurdo | South Fork of Salado Arroyo | Irrigation-Power | 1,225.100 | | |
| James Cowan | Red River or Canadian River | Irrigation | 320 | | |
| Roscoe Rodgers, Chas. B. Erbacher, G. M. Williams | Cameron or Lone Mountain Creek. | Irrigation | 25,000 | | |
| Idell D. Hand | Mora River | Irrigation | 120 | | |
| Idell Appel and W. R. Winburn | Cimarron River | Irrigation-Power | | | |
| Idell J. Holson and Fred H. Wing | Whiskey Creek | Irrigation | 600 | | |
| Benjamin G. Randall | Rio de San Fernando de Taos | Irrigation | 100 | | |
| Sacramento Mines | Whitewater Creek | Irrigation | 142 | | |
| J. W. Lewis | Cass Draw | Mining-Power | | | |
| Merrill H. Fisher | Good waters Fresno Creek | Irrigation | 400 | | |
| Wm. L. Aubrey and A. M. Crozier | Gila River | Irrigation-Power | 2,000 | | |
| Frank W. Beach | El Paso Canon | Irrigation | 10,000 | | |
| Gila Farm Company | Gila River | Irrigation | 30,000 | | |
| | | | 283,000 | | |

* * * Remainder of applications pending.



Pumping Barge, No 3 Station (Williston Project). NORTH DAKOTA PROJECTS
Setting Basin (Williston Project). Irrigable Land, showing canal, (Buford-Trenton Project).

North Dakota

Buford-Trenton, Williston and Nesson Projects.

(Write U. S. Reclamation Project Engineer, Buford, N. D.; U. S. Reclamation Engineer, Williston, N. D.; Buford Trenton Water Users' Association, Buford, N. D.; Nesson Valley Water Users' Association, Nesson, N. D.)

These are wholly different from the other Federal Reclamation Projects.

The water is taken from the Missouri River a few miles east of the western boundary of the state. The banks of the river are of loose shifting dirt without permanent rock stratification. This formation renders necessary the plan of locating the huge pumps, which are needed to raise the water to higher elevations so that through gravity it may serve the lands, upon floating foundations anchored in the river.

These pumps are run by electricity, generated at power plants upon the shore, through the use of lignite coal that is found throughout that region. This lignite underlies virtually all of the western half of that state in deposits that, like vast blankets, are spread beneath the earth. These deposits are cut by the ravines or coulees, making the mining of the coal easy and economical.

The Government has withdrawn a certain section of these coal lands and there it mines the fuel required to generate power for the enormous floating pumps.

The initial Buford-Trenton unit includes 12,000 acres, the unit near Williston, 15,000 acres, and the Nesson Project 15,000 acres.

A main power plant is located near the coal mines and power transmitted to the four pumping plants and 12,000 acres is being served. Eventually 40,000 acres will be irrigated.

The total farm unit limit varies from 40 to 80 up to 160 acres of irrigable land. Water rights cost \$38 per acre, payable in from 5 to 10 annual installments.

The maintenance charge is as follows: 70 cents per acre whether water is used or not, and 50 cents for each acre-foot pumped and delivered within any year. No water will be furnished unless all assessments are paid.

Virtually all of the land has been taken. In August, 1908, only 16 farm units remained unclaimed.

Deeded lands may be bought for from \$25 per acre up—in advance of any payment for water rights.

Five years' residence on land or ten years' residence within 20 miles of land is required before title to water right is secured.

Rainfall is about 15 inches. Altitude less than 2000 feet. Temperature ranges from below 40 degrees below zero to over 100 degrees above, and averages about 10 degrees above zero in winter and 70 degrees in summer.

Frosts occur as late as the middle of May.

The soil is a heavy loam with considerable clay in some sections. The sub-soil is fine sand.

Wheat, oats, flax, barley, speltz, corn, alfalfa and sugar beets are grown.

The markets are in the east.

The Great Northern Railway traverses the lands.



Main Canal: Lower Yellowstone Project.

The Missouri River is navigable but, because of its shifting channel and many and constantly changing sand bars, is treacherous.

Williston, Buford and Trenton are the principal towns.

In August, 1908, there were about one dozen farm units on the Buford-Trenton Project which had not been filed upon. Three of those units are under the first unit of the project, and water can be delivered immediately. The other units are under future extensions and may not receive water before two or three years, depending upon the length of time required for the construction of canals and ditches. The size of these units varies from 40 to 160 acres, depending upon the character of the soil and proximity to towns.

Lower Yellowstone Project.

(Write U. S. Reclamation Service, Glendive, Mont.; U. S. Land Office, Miles

City, Mont.; or Williston, N. D.; Lower Yellowstone Water Users' Association, Sidney, Mont.)

This project covers the diversion of the waters of the Yellowstone River, at a point 17 miles northeast of Glendive, for the irrigation of 66,000 acres in northeastern Montana and northwestern North Dakota. The acreage is divided as follows: Montana private lands, 14,618; public lands, 13,522; railroad lands, 16,742; North Dakota, private lands, 12,786; public lands, 8,332 acres.

The size of the farm unit will probably be 80 acres.

If homesteaded the cost is usual fees plus cost of water right. This water cost has not been determined but will approximate \$45 per acre. The cost of the annual maintenance charge has been fixed at \$1.00 per acre annually.

Over three-fourths of the land is a dark, rich loam and the balance is a light loam and various other rich soils.

The length of residence required is five years.

Deeded lands are held at from \$10 to \$25 per acre, plus water right charge. Altitude, about 2,000 feet. Rainfall, 12 to 16 inches.

Temperature, 110 degrees above to 50 degrees below zero.

Products: Forage, grain and vegetables.

Railroads: Great Northern and Northern Pacific.

Nearest towns are Glendive and Mondak.

The project will probably be completed in 1909 or 1910.



Truckee-Carson Project. The Truckee River is here turned from its channel into the canals of the irrigation system.

Oregon

Umatilla Project.

(Write Umatilla Water Users' Association, Hermiston, Ore., or U. S. Land Office, La Grange, Ore.)

This embraces about 20,000 acres lying south of the Columbia and east of the Umatilla Rivers. The engineering work consists of a feed canal, 26 miles long, leading from the latter river to the Cold Springs reservoir, having a capacity of 48,000 acre-feet, and a distributing system of canals and ditches. The work is simple in character and easy of construction.

About 10% of the land is in public ownership, but this land is not open for settlement and will not be so opened until water is provided for it. There are already enough people on the field awaiting the opening to file on this public land. The project will be finished about 1910.

Relinquishments may be purchased. Deeded land costs from \$50 to \$200 per acre. Water rights cost \$60 per acre in ten equal annual installments without interest. The annual maintenance charge is \$1.00 per acre.

Altitude from 350 to 500 feet. Temperature from 6 degrees below zero to 110 degrees above. Rainfall, 9 inches. Atmosphere, dry.

The soil is a rich, sandy loam of good depth, light texture with a good subsoil.

Crops are vegetables, berries, melons, deciduous fruits, grapes, English walnuts, almonds, alfalfa, etc.

The O. R. & N. Ry. goes through the heart of the project. Freight may also be shipped via steamers on the Columbia River.

The farm unit is 10, 20 and 40 acres, depending on distance from Hermiston. Constant residence on homesteads is required. On deeded land one may live within 20 miles of the project.

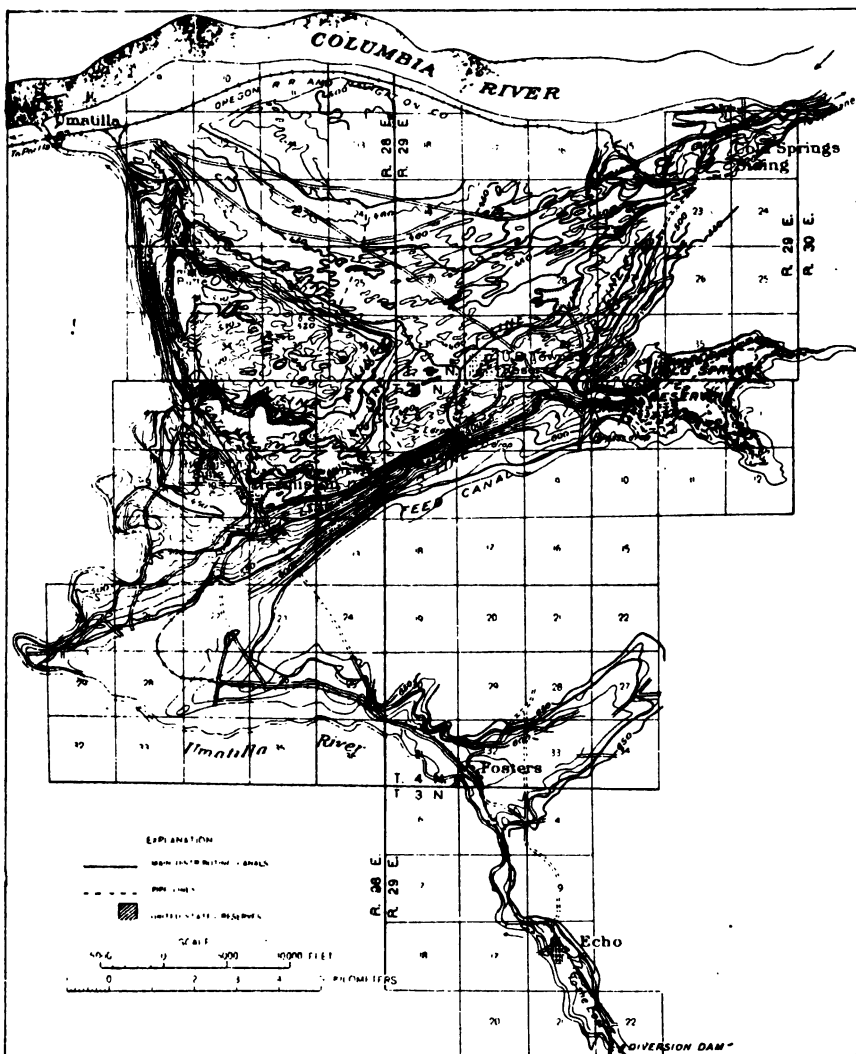
Towns: Hermiston, Umatilla and Echo.

No water for use on land under private ownership will be furnished any land owner who is not an actual resident on the land or an occupant thereof residing within 20 miles of the land.

Water for domestic purposes is obtained from wells of from 30 to 75 feet in depth.

The lands of the project are comprised of a rolling sage-brush plain, lying in a triangle between the Columbia River on the north and the Umatilla on the south and east.

The reservoir will impound water sufficient to serve the lands with approximately $2\frac{1}{2}$ acre-feet each season.



DEPARTMENT OF THE INTERIOR
UNITED STATES RECLAMATION SERVICE
UMATILLA PROJECT - EAST BRANCH - OREGON
GENERAL MAP

OREGON—CALIFORNIA.

Klamath Project.

(Write Klamath Water Users' Association, Klamath Falls, Oregon; U. S. Reclamation Service, Klamath Falls, Oregon; U. S. Land Office at Redding or Susanville, California, or Lakeview, Oregon.)

This project contemplates the reclamation of 190,000 acres in Klamath County, Oregon, and Modoc and Siskiyou Counties, California, and includes not only the irrigation of the uplands but the drainage of several lakes and swamps and the utilization of the lands they occupy.

Practically all of the uplands are now in private ownership. The upland soil is a disintegrated lava and in the lowlands the soil is a lake sediment.

The farm unit has been tentatively fixed at 160 acres, although this may be reduced later.

The length of residence has not been definitely fixed, but this will probably be from 5 to 10 years.

Land is held at from \$15 to \$50 per acre.

The water rights will cost from \$25 to \$30 per acre, and the annual maintenance charge is 75 cents per acre.

Altitude, 4100 feet. Rainfall, 14 inches.

Temperature from 100 degrees to 5 degrees below zero.

Products: Forage, grain and vegetables.

Railroads: C. N. E. and Southern Pacific.

Towns: Klamath Falls, Bonanza and Merrill.

Deschutes Project.

(Write the Deschutes Irrigation & Power Company, Bend, Crook County, Oregon.)

The water of the Deschutes river is diverted by a gravity system of canals whereby 214,000 acres of land are irrigated. The main canal reaches the irrigated land at a point about four miles from the diversion.

This is a Carey Act project. The land is patented to the State of Oregon by the United States Government, the state giving the deed direct to the settler.

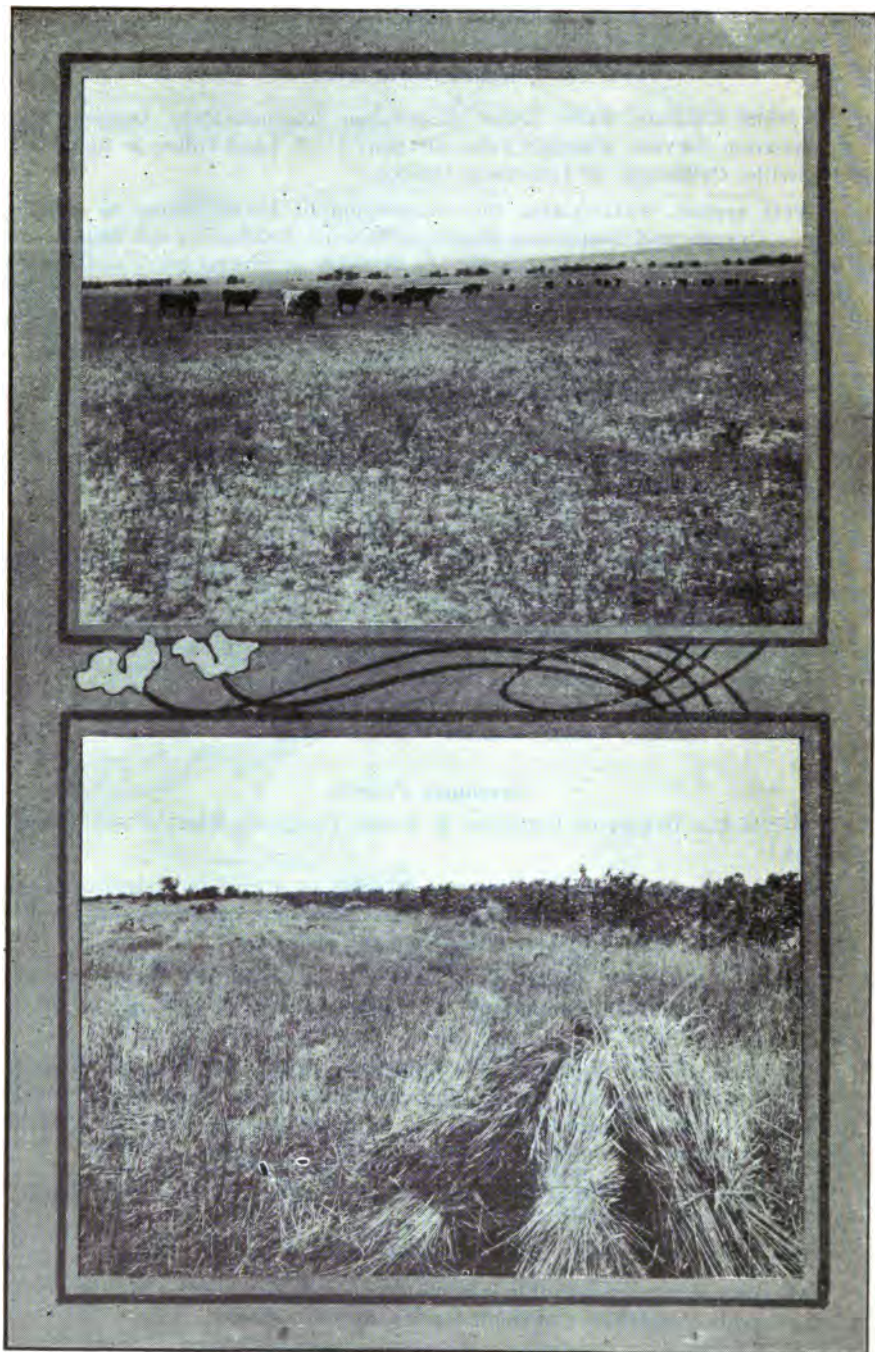
The farm unit is 160 acres. Any citizen, or person declaring his intention to become a citizen can file on this land, but within three years he must make residence of three months and cultivate at least one-eighth of the irrigable acreage to secure a deed from the State.

The cost of perpetual water right is \$40 per irrigable acre; the maintenance charge being 80c per acre per year.

The soil is volcanic ash and decomposed lava of great fertility.

All products common to this latitude are raised with profit. Alfalfa, clover, all the cereals, vegetables and small fruits grow in profusion.

Altitude 2,700 to 3,600 feet.



Views on Belle Fourche Project.

South Dakota

Belle Fourche Project.

(Write Belle Fourche Water Users' Association, Belle Fourche, S. D.; U. S. Land Office, Rapid City, S. D.)

When completed this project will reclaim 100,000 acres in Butte and Meade counties. This land is tributary to the C. & N. W., and the C. B. & Q. and C. M. & St. P. are not far distant.

Practically 50% is open for entry.

Deeded lands may be had at from \$12 per acre up, according to location, etc.

The water right will cost about \$30 in ten annual installments. Constant residence, until water right is patented, is required. The maintenance charge will be from 40 to 50 cents per acre.

The lands vary from flat to rolling and the soil is all good. South of the river it is a sandy loam and to the north shading into a heavy clay. It is all very free from alkali or deleterious salts.

Products are hardy fruits, grain, vegetables, alfalfa, etc.

The markets are first-class, the mining towns in the Black Hills being most prominent.

Atmosphere, dry. Altitude, 2700 to 3500 feet. Temperature, from below zero to 100 deg. The rainy season extends from April to June and an average of from 14 to 16 inches falls each year.

Principal towns are Belle Fourche, Sturges, Whitewood and Vale.

Report of State Engineer.

Mr. Samuel H. Lea, State Engineer of South Dakota, has supplied the information which follows with reference to irrigation conditions within that State.

The following information relative to South Dakota irrigation conditions with much additional matter is incorporated in Mr. Lea's report for 1907-8, and represents conditions existing during that period:

There is practically no irrigation on a commercial scale in eastern South Dakota. In former years there was a movement to utilize artesian wells as a source of water supply for irrigating agricultural land in various localities east of the Missouri river. This movement was only of temporary duration, existing during a period of so-called dry years, when the rainfall was insufficient for producing crops under the conditions then existing. In recent years the practice of irrigation in the region under consideration has been generally discontinued.

In the western portion of the state there are a number of irrigation systems in use, some of them of considerable importance. Outside of the Indian reservations the country, although still largely undeveloped, is rapidly settling up, especially in the country adjacent to the three new lines of railroad extending westward through the state. In this newly settled region there have been constructed many small reservoirs for storing storm water. These reservoirs are used principally as a source of water supply for stock, although in many cases small areas are irrigated from them for raising alfalfa or vegetables and other products for local use. There will be need for considerable development in the way of irrigation in this region after conditions become more settled and the population becomes denser.

The largest and most important private irrigation enterprises in the state are situated in the region adjacent to the Black Hills comprising the counties of Butte, Lawrence, Meade, Pennington, Custer, and Fall River. A brief synopsis will be given, descriptive of the principal irrigation systems of this character.

Red Water Canal.

This ditch is the property of the Red Water Land and Canal Company, a corporation which operates the enterprise on a commercial basis, furnishing water to farmers for irrigating lands which lie under the ditch. The total length of the ditch is 42 miles but only 30 miles are in use, the lower 12 miles having been abandoned. The ditch is not operated to its full capacity, as shown by measurements made by the U. S. Geological survey. From this data it appears that at the period of maximum flow there was a discharge of 70.5 cubic feet of water per second. The area irrigated is stated to be about 5,000 acres, and under the water code, which allows an appropriation of 1 cubic foot of water per second for each 70 acres irrigated, a flow of 71.4 second-feet of water would be required, which corresponds approximately with the maximum discharge.

The price charged to farmers is \$1.50 per miner's inch per year, the miner's inch being, under the former law, equivalent to 1.40 of a second-foot. For small garden patches the charge is \$1.50 per year for each acre irrigated. Water is supplied to about 60 customers, the flow being regulated and measured by weirs at the lateral headgates.

Edgemont Canal.

This canal was constructed in the early "nineties" by the Edgemont Company for the purpose of irrigating a tract of about 4,000 acres of land in the Cheyenne River valley. A short while after its completion the company suspended operations and the canal was not used for a number of years. The point of diversion is on the Cheyenne river a short distance below the mouth of Beaver Creek, and the canal extends down the valley on the south side of the river for a distance of 14 miles to the town of Edgemont in Fall River county. The canal has recently been repaired and is now in active use; arrangements have been made to irrigate about 2,000 acres of land.

Cascade Canal.

This is one of the most successful private irrigation enterprises in the state. It was constructed originally by Herman Mahler for his individual use in irrigating his own land, but the ditch has been enlarged and extended to supply the needs of neighboring farmers until its full capacity has been reached. It is now the property of his successors, the Cheyenne Valley Ranch Company. The source of supply is a group of springs situated in Fall River county about 10 miles southeast of the town of Hot Springs. These unite and form Cascade Creek, a tributary of the Cheyenne river.

The upper portion of this ditch supplies water to eight farmers, including the present proprietors. About 900 acres of land are irrigated from this portion, requiring a flow of 13 second-feet of the total flow of 30 second-feet of water in the ditch.

An extension of this ditch beyond the original terminus has been made by the Hot Springs Irrigation and Live Stock Co., who have a water right covering the remaining 17 second-feet of water in the ditch. This extension is about 12 miles long and it carries the ditch into the valley of the Cheyenne River below the mouth of Cascade Creek.

Iowa and Hawthorne Ditches.

These two ditches are fair types of a number of irrigation systems in use in Rapid Creek valley. They are, in a sense, community ditches, since they are owned by the farmers who use the water for irrigation. The Iowa ditch is the highest irrigation ditch now being operated in Rapid Valley; its headgate is situated within the limits of Rapid City, above which place little irrigation is done in this valley at the present time. The ditch is 6 miles long and has a capacity of 15 second-feet. There are 1,023 acres of land under it, which is as much as can be irrigated under present conditions. The grade of this ditch is rather light and, since Rapid Creek has a heavy fall, an elevation considerably above the lower portion of the valley is soon attained. This is advantageous in one way, because it takes in a large area of irrigable land at some distance from the creek. It would be better, however, for the ditch to have a heavier fall, in order to create sufficient current to carry down the fine silt and other suspended matter in the water, instead of having it deposited in the channel.

The statement is made that the projectors of the Iowa ditch intended to extend it for a distance of about 30 miles below Rapid City in order to take in a large body of fine agricultural land situated mainly on the ridge between Rapid and Box Elder Creeks. This is an ambitious project but it was found to be impracticable under existing conditions, the main difficulty being the lack of sufficient water. The Iowa ditch is junior in priority of right to appropriate water to a number of ditches lower down the valley and, during the irrigation season, the water supply is subject to the needs of prior appropriators.

It is claimed that the ditch can easily be extended as originally designed, and that a suitable water supply can be obtained by means of storage reservoirs. These are to be located at suitable places along the route and are to be filled by flood flow from Rapid Creek. No surveys have been made to determine the feasibility of this proposition, although a reconnaissance was made by Mr. W.

H. Hall of Rapid City, who reported favorably thereon. The principal difficulty would appear to be the lack of reservoir sites, but a careful survey may disclose a sufficient number of draws or tributary valleys above the ditch to furnish the storage capacity needed.

The Hawthorne ditch, including a proposed extension, is 8.5 miles long and has a stated capacity of about 30 second-feet of water. The headgate is situated about $1\frac{1}{2}$ miles below Rapid City, the water being turned into the ditch by means of a diversion dam. There are 2,022 acres of irrigable land under the ditch and the available water supply is barely sufficient for this area. This ditch is operated on the community plan, the stockholders being owners of land under it.

Small Ditches.

There are a number of small private irrigation works on various streams in the western part of the state, the greatest development being in the valleys of Spearfish and Rapid Creek. In the former valley irrigation has been carried on systematically for a number of years and the products are largely fruits and vegetables. The same is true of Fall River valley, especially the upper portion near the city of Hot Springs. Rapid Creek valley, however, is given over mostly to hay, the holdings containing several hundred acres each.

There are a great many instances of practical irrigation, where storm water is collected in small storage reservoirs and used on the land as far as it will go. This method is used in localities where there are no running streams available for water supply. It furnishes only a partial supply of water for irrigation but is productive of good results in the way of crops.

The use of artesian water for irrigation has not been practiced to any extent in the western part of the state, but there is one instance where it promises to be effective, which will be cited. The Stearns farm in the southern part of Butte county contains altogether 320 acres of land. This farm has an artesian well which has force enough to operate a motor by means of which electricity is generated for lighting cattle barns and sheep pens, as well as the farm residence. In addition to this, practically all the household machinery is also furnished with electric current sufficient for operation. A second artesian well has recently been sunk on this farm which is said to have a flow sufficient, with proper care, to irrigate 160 acres of land. This is an unusually strong flow, and the success attained in obtaining wells on this farm indicates the possibility of using the same methods in reclaiming other lands in the vicinity.

The Belle Fourche Project.

The United States Reclamation Service has now under construction in this state an important irrigation system, known as the Belle Fourche Project. The following information concerning this project has been taken largely from the sixth annual report of the Reclamation Service.

The location is in Butte and Meade counties, occupying townships 6 to 9 north, ranges 3 to 8 east, Black Hills Meridian. The altitude is from 2,600 to 3,000 feet above sea level. The Chicago and Northwestern Railway is adjacent; the Chicago, Burlington & Quincy Railroad is 14 miles southwest; and the Chicago, Milwaukee & St. Paul Railroad is 50 miles southeast of the project.

The principal markets are: Omaha, Sioux City, Chicago, Minneapolis, St. Paul, Deadwood, Lead, and mining camps in the Black Hills. The irrigable area is located in townships 7 to 10 north, ranges 2 to 7 east, Black Hills Meridian. Extent east and west about 40 miles, north and south about 13 miles; average elevation 2,800 feet; character of soil, north side of valley clayey loam, south side sandy loam. Range of temperature: maximum, 100 degrees; minimum minus 30 degrees.

Average annual rainfall 14 to 18 inches. Size of farm units, 80 acres of irrigable land. Value of irrigated land, \$75 to \$100 per acre. Principal products: Alfalfa, grain, vegetables, hardy fruits, sugar beets, native hay. Duty of water: 2 acre-feet per annum. Watershed: 4,300 square miles. Average rainfall: 18 to 25 inches in mountains. Average annual discharge of Belle Fourche river at head of inlet canal: 400,000 acre-feet. Storage reservoir: area, 8,000 acres; capacity: 203,770 acre-feet. Storage dam: earth dam with concrete revetment; length on top, 6,200 feet; maximum height, 115 feet. Diversion dam: gravity section concrete; length 400 feet, height 23 feet. Main canals: length 100 miles; width on bottom 14 to 40 feet. Lateral canals: length 125 miles. Sublateral canals: aggregate length 1,000 miles.

Construction work on this great project was commenced in April, 1905, and has been carried on continuously since that time. This project is intended to reclaim about 100,000 acres of land in the Belle Fourche valley, beginning about two miles east of the town of Belle Fourche and extending east for a distance of forty miles. The valley lands on both sides of the river are included in the irrigable area.

The main supply canal and the diversion dam have been completed and the water turned in. The waters of the Belle Fourche river run through this canal and are to be stored in the Owl creek reservoir, which will hold sufficient water to irrigate completely all lands on the project except about 4,000 acres which are above the reservoir and will receive water from the river.

Two canals carry the water from the reservoir to the lands. One, the north canal, runs in a northerly and easterly direction and serves land in Indian, Horse, Dry and Willow Creek valleys. The other, the south canal, runs in a southerly and then easterly direction and irrigates lands in Owl Creek valley and the land on the south side of the river in the vicinity of Vale and Empire.

The first section of the south canal has been completed and water was furnished for 8,000 acres of land under it and for 4,000 acres under the inlet canal during the irrigating season of 1908. The area that will receive water will be increased each year as the several canals are completed, until the final completion in 1910.

The irrigable lands under this project comprise a number of tributary creek valleys on both sides of the Belle Fourche river. Good crops are now raised in these valleys in the years that the rainfall is sufficient, but crops can not be depended upon every year without irrigation.

Many of the farm units contain, besides 80 acres of irrigable land, 40 or 80 acres of high or rough land which cannot be irrigated, but is valuable to the settler for grazing or, in occasional years, for dry crops.

A tract of land, 640 acres in area, has been reserved for a town site. This is located near the center of the project and it is thought it will be the center of a large farming community after the system is in operation. The land will

be laid off into streets, blocks and lots, and the lots will be appraised and sold at public auction. It is expected that the proceeds of the sales of these lots will be available for municipal improvements, school houses, parks, streets, etc.

Work on this project is now being vigorously carried on by a large force of men, and it is expected that the date of final completion will be not later than the year 1910. Operations are under the direction of Mr. R. F. Walter, Project Engineer, who has been in local charge since the beginning of the work.

Grand River Project.

In February, 1907, the U. S. Government, through Mr. H. N. Savage, a supervising engineer of the U. S. Reclamation Service, appropriated the waters of the North Fork of Grand River, in Butte county, for irrigation purposes. The appropriation was made for the lands covered by the Grand River Project, which is to be undertaken by the U. S. Reclamation Service. This project covers about 10,000 acres, of which about 7,000 acres are in North Dakota and 3,000 acres in South Dakota.

No action concerning this project has been taken since the date mentioned but in May, 1908, the following letter relating thereto was received:

Bismarck, N. Dak., May 15, 1908.

Mr. Samuel H. Lea, State Engineer, Pierre, S. D.

Dear Sir:— In September of 1906 I made preliminary survey for the North Fork of the Grand River, Bowman County, this state. This project covers approximately 10,000 acres and probably two or three thousand of which will be in South Dakota.

I have recently visited this locality and find the settlers very anxious to have this project constructed by the Reclamation Service. It is possible that I may form a Water User's Association and take the matter to the Secretary of the Interior this season. Would you care to cooperate with me in forwarding this movement and if so would be very much pleased to have you meet me in this locality and help secure stock subscriptions to the Association a little later in the season.

I would be much pleased to have you advise me at your early convenience if you would care to assist in this project as stated above.

Yours very truly,

T. R. Atkinson,
State Engineer.

In answer to this letter the following reply was sent:

Pierre, S. D., May 19, 1908.

Mr. T. R. Atkinson, State Engineer, Bismarck, N. Dak.

Dear Sir:—I note with much interest what you say in your letter of the 15th, instant, concerning the Grand River Project. The streams in this state which will be covered by this project were withdrawn from appropriation last year at the request of an engineer of the U. S. Reclamation Service.

I shall be very glad to cooperate with you in any way I can in forwarding the movement and will await your suggestions as to the best methods. I am quite busy at the present time with local official duties, but will try to arrange to meet you at such time as you may think best if notified a short time in advance.

Yours very truly,

Samuel H. Lea,
State Engineer.

As soon as the time is favorable for taking up this project it will receive due consideration from this department, and proper action will be taken.

Other Reclamation Projects.

In addition to the Belle Fourche Project and the proposed Grand River Project other irrigation propositions in the state have been considered. Examinations or reconnaissances of these propositions have been made by engineers of the Reclamation Service. Preliminary reports have been published and these reports are given here. The officials of the Reclamation Service have not indicated that there is any probability of taking up any of the propositions considered, but it is thought that one or two of them might be carried out under the Carey Act in the event this act is made applicable to South Dakota.

The following reports are taken mainly from the Third Annual Report of the Reclamation Service:

Rapid Creek Reconnaissance.

There is probably some water available for storage from Rapid Creek, if the amount needed for lands now in cultivation below Rapid City is used economically and none is wasted.

The best land available for reclamation is on the north slope of Box Elder Creek and is mostly in private ownership. To reclaim this area all the spring and flood flow of Rapid and Box Elder creeks must be stored. The only feasible site is on Box Elder creek near the town of Blackhawk, to reach which a diversion of rapid Creek must be made about 6 miles above Rapid City. This diversion would interfere with two plants at Rapid City that use the water for power purposes, unless arrangements for local storage at the point of diversion could be made.

There is probably sufficient water available to reclaim 20,000 acres if the above complication were removed. It is thought that the storage previously referred to, along the proposed extension of the Iowa Ditch, might be sufficient to reclaim about 30,000 acres lower down the valley.

Little Missouri River Reconnaissance.

During the summer of 1904 a possible storage system by which the flood waters of the Little Missouri river could be utilized for irrigation was surveyed near Alzada, Montana.

Gaging stations were established on the river near the reservoir site and at Camp Crook, S. D., near the irrigable land, and a careful record of the available flow was kept daily. The land is mostly owned by the government and possibly 40,000 acres may be reclaimed as railroad facilities come within reach of this territory.

Cheyenne River Reconnaissance.

A reconnaissance was made in the summer of 1904 of the upper watershed of the Cheyenne River for possible reservoir sites. None were found on the main river that could be constructed at a cost permissible by the amount of land to be reclaimed. Possible sites were located at Hat Creek and Beaver Creek, but as nothing was known of the flow of these creeks gaging stations were established, so that a careful study of the water supply of each could be made.

The Cheyenne river has a drainage area of about 7,350 square miles above

Edgemont, S. D. The stream is sandy and dry for a large part of the summer, although subject to floods in the springtime from melting snow and through the summer from sudden storms.

About 40,000 acres of first class land are situated along this river, but even if the water supply should be satisfactory, the cost of reclamation would be high on account of the irrigable tracts being scattered, requiring long and expensive canals. The land is mostly in private ownership.

Irrigable Areas.

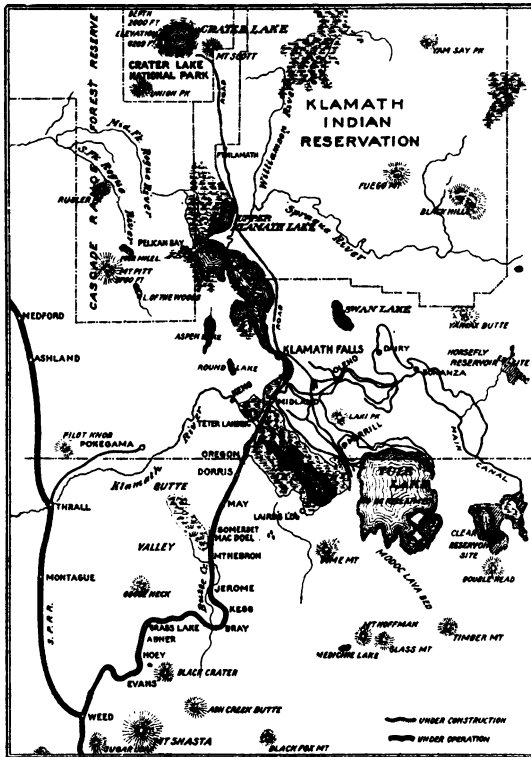
Numerous estimates have been made concerning the extent of irrigable land in South Dakota. This office has devoted considerable time and attention to the collection of trustworthy data on this subject. From information obtained from various sources and from the records of this office the following statement has been compiled, showing the areas that are now under irrigation, including those that will be supplied with water January 1, 1909; also areas that will be reclaimed when present undertakings are completed.

| Areas that will be supplied with water Jan. 1, 1909. | Acres. |
|--|-------------------|
| Redwater Canal | 5,000.00 |
| Spearfish Valley | 5,335.00 |
| Little Missouri Water District | 213.00 |
| Belle Fourche " " | 8,242.13 |
| Elk Creek " " | 75.00 |
| Rapid Creek " " | 15,278.00 |
| Battle Creek " " | 148.66 |
| Fall River " " | 3,900.64 |
| South Cheyenne " " | 2,708.60 |
| Belle Fourche Project | 12,000.00 |
| Reservoir Filings (estimated) | 14,000.00 |
| Total | 61,901.03 |
| Additional areas to be reclaimed under present undertakings. | Acres |
| Little Missouri Water District | 631.77 |
| Grand River " " | 1,201.11 |
| Moreau River " " | 434.88 |
| Belle Fourche " " | 1,872.21 |
| Elk Creek " " | 727.20 |
| Rapid Creek " " | 2,237.60 |
| Battle Creek " " | 461.70 |
| Fall River " " | 750.00 |
| South Cheyenne " " | 3,640.00 |
| Belle Fourche Project | 88,000.00 |
| Reservoir Filings (estimated) | 30,000.00 |
| Total | 129,956.47 |
| Add area to be irrigated Jan. 1, 1909 | 61,901.03 |
| Grand total | 191,857.50 |

Small Reservoirs.

An important factor in the irrigation development of the state is the use of small storage reservoirs for irrigating isolated tracts of land. There are a great many such reservoirs in western South Dakota, situated principally on the prairies above the reach of gravity flow from running streams and dependent on the precipitation over the catchment area above them for a water supply. While the area irrigated by an individual reservoir system is necessarily small, the aggregate area reclaimed by them all is quite large.

A typical instance of irrigation by such methods is afforded in the Barber Reservoirs, built several years ago on a homestead situated about five miles from the town of Belle Fourche. These reservoirs, while rather crudely constructed, have done excellent service in storing and furnishing water for growing crops upon semi-arid land.—2d. Bien. Report State Eng. S. D., 1907-8.



Klamath Project.

Utah

Strawberry Valley.

(Write Strawberry Valley Water Users' Association, Spanish Fork, Utah;
Project Engineer, U. S. Reclamation Service, Provo, Utah.)

To provide for the irrigation of about 60,000 acres of land in central Utah, a few miles south of Provo, a reservoir will be built about 30 miles east of the irrigable area. By means of a four mile tunnel the stored waters will be carried under the divide and the waters delivered via Spanish Fork through a canal system upon the lands to be watered.

This land has a mean elevation of 4500 feet and is reached by the Salt Lake and the R. G. W. Railroads.

The country is all settled, the public land all having been claimed years ago. It is held at from \$40 to \$200 per acre, depending upon the priority of water right, distance from towns, etc.

The maximum farm unit is 160 acres.

The water right will cost about \$50 per acre. The maintenance charge has not been decided.

Fruit, grain and hay are the principal products.

Location, Utah and Wasatch counties, Utah.

Latitude, North 40 deg. 14 min.; longitude West 110 deg. 40 min.

Principal markets: Salt Lake and adjacent mining districts.

Irrigable land: 30,000 acres, 5 to 15 miles south of Provo, Utah.

Soil: Sandy loam; gravel, with deep black soil in lowlands.

Temperature: 90 deg. to 18 deg. Rainfall, 18 inches.

Duty of water: 1 cubic foot per second at headgates for each 80 acres.

Watershed area, 200 square miles.

Average annual discharge, 65,600 acre-feet.

Area storage reservoir in Strawberry Valley 6,800 acres; capacity, 110,000 acre feet.

Storage dam on Strawberry River: loose rock, with concrete core wall, backed with earth. Length 325 feet, 45 feet high, 25 feet wide on top.

Diversion dam on Spanish Fork: Re-enforced concrete; 16 feet high, 70 feet long.

Main canals: Length, 30 miles; capacity 500 second-feet for 3 miles, 180 for 20 miles, 100 for 7 miles.

Power developed: 3,000 horsepower.

Power transmission line: 35 miles.

Telephone line: 38 miles.

Wagon road (to Strawberry Tunnel): 32 miles.

Principal towns: Provo, Spanish Fork, Payson, Salem and Springville.

When completed, the irrigation works will consist of the following features: The Strawberry reservoir, in which it will be possible to impound 110,000 acre-feet of water by erecting a dam 45 feet high across Strawberry River; the Strawberry tunnel, 18,500 feet long, with a capacity of 500 second-feet, by which the water from the Strawberry reservoir is taken through the rim of the Great Basin; concrete diversion dam and headworks on the Spanish Fork, the dam to be 16 feet high and 70 feet long; power canal 3 miles long, having a capacity of 500 second-feet; about 30 miles of main canals, with necessary turnouts and laterals; a hydro-electric power plant that will generate about 3,000 horsepower, and several pumping plants that will be used for pumping water for irrigation purposes.



Cement Lined Canal. Truckee-Carson Project.

Washington

Okanogan Project.

(Write Okanogan Water Users' Association, North Alma, Wash.; or U. S. Land Office, Waterville, Wash.; Commercial Club, Omak, Riverside, or Okanogan, Wash.)

The 8,650 acres embraced in this project are near the center of Okanogan County, north of the central part of the State of Washington. The Coville Indian Reservation is immediately to the east of this tract.

The area to which water is to be supplied is called Pogue's Prairie or Pogue's Flat. It is about ten miles long and from one to four miles wide, and contains a total of about 13,000 acres.

The water is taken from Salmon Creek, a tributary of the Okanogan River, which is a branch of the great Columbia.

Much of this land has been in orchards for nearly twenty years and the conditions for growing deciduous fruits and berries have proven splendid.

The soil is volcanic ash and lies in the bottom-lands. There is a gravel subsoil.

The climate is temperate and the air dry. Snow covers the ground from November to March. Sometimes the thermometer goes below zero, but seldom for more than a few days at a time. In the summer the average is about 90 deg. at midday, although occasionally the mercury passes 100 deg.

Altitude 850 to 1300 feet. Rainfall very light.

The farm unit is 40 acres. The holder must be an actual settler and live on or near his land constantly.

Practically all of the land is held in private ownership. There is no Government land open to homestead entry.

Land is now selling at from \$80 to \$150 and up per acre, exclusive of the water right. This water right will cost about \$50 per acre, payable in ten yearly installments. Maintenance charge \$1.50 per acre annually.

Drinking water is had from wells. Sometimes water is found at 25 feet, although sometimes a well 150 feet deep must be sunk.

There are no railroads on the tract at present.

The Great Northern has surveyed a line through the Okanogan Valley. At present one may go to Brewster by boat or to Oroville by the G. N. R. R. and there take a stage to the project.

There are good opportunities for one who has means of from \$1000 up.

The principal towns are Okanogan, Omak and Riverside.

About 40,000 acres in the south part of Douglas County will be thrown open



Apples Grown on Yakima Project.

on Oct. 30, 1908. This was withdrawn at the time the Big Bend project investigation was under way. The land has not been irrigated. It is subject to homestead or desert entry.

Yakima Valley Project.

In the valleys drained by the Yakima River on the east side of the Cascades is alluvial soil that is of great richness. It has been estimated that, through impounding, water may be provided in a sufficient quantity to serve nearly half a million acres of this land. To this end dams are being erected at the outlets of several mountain lakes, the capacities of which total 804,000 acre-feet.

The service of this water is handled as one vast community of projects, but for convenience is subdivided as follows:

| Name of Unit. | Area (acres). |
|-----------------|---------------|
| Tieton | 24,000 |
| Sunnyside | 86,600 |
| Wapato | 100,000 |
| Kittitas | 60,000 |
| | <hr/> |
| | 270,600 |

The first three are taken up at length in the following pages.

The Kittitas project refers to land near Ellensburg that will be served by a canal 90 miles long conveying water from the Yakima River near Easton. The lands are higher and the growing season shorter than in the neighboring valleys. Work has not been begun on this unit.



Cherry Orchard on the Yakima Project.

Sunnyside Project.

(Write Sunnyside Water Users' Association, Sunnyside, Wash.; U. S. Land Office, Zillah, Wash.)

In Yakima Valley of Washington, and in Yakima and Benton counties lies a strip of land 65 miles long and varying from 1 to 12 miles in width, known as the Sunnyside Valley.

For some years approximately 45,000 acres of this land have been under irrigation; the system that supplied the water being the Washington Irrigation Co., a syndical enterprise. In July, 1906, this system was purchased by the Government, and it is now being reconstructed, enlarged and lengthened.

Pumping plants will be established to furnish water to lands above the gravity flow of the canal, and a large siphon will be built across the Yakima to serve the lands known as the "Mabton Flats."

This enlargement will bring the total area to be served to about 95,000 acres in all.

All of these lands are in private ownership excepting about 3,000 acres.

This relatively small tract of public land is not now open for filing and will not be subject to entry until the canals are completed. This will probably be in the spring of 1909.

The farm unit is 80 acres. Each settler is required to purchase a water right from the Government. This water right will cost about \$50, being the proportionate cost of the canal. This will be payable in ten equal annual installments. The annual maintenance charge is 95 cents per acre.

Deeded lands cost from \$30 per acre upwards plus the cost of the water right.

Lands formerly owned by the Washington Irrigation Company cost from \$85 per acre upwards, plus \$10 per acre for Government water rights.

The soil is light and easily tilled. There is scarcely any rainfall. The altitude is about 800 feet. Temperature ranges from below zero to over 100 deg. Lands may be irrigated from April to November.

The crops are deciduous fruits, berries, grain, hay, hops and poultry.

The Northern Pacific R. R. crosses the lands.

The principal towns are Sunnyside, Parker, Zillah, Outlook, Granger, Grand View, Belma and Prosser.

Constant residence is required.

Tieton Project.

(Write Tieton Water Users' Association, North Yakima, Wash.; Project Engineer, U. S. Reclamation Service, North Yakima, Wash.)

The Yakima Valley contains approximately 500,000 acres and it is estimated that with storage the water is sufficient for 340,000 acres. This area includes about 100,000 acres of Yakima Indian Reservation lands.

The Government has undertaken the irrigation of this wide area, and that which is known as the Tieton Division embracing some 24,000 acres is an integral thereof.

Construction began during the winter of 1906-7 and will be finished in 1909. There is very little public land in the Tieton Project.

Private lands range in price from \$50 to \$150 per acre for raw, unimproved land, upwards, and for improved lands as high as \$1000 per acre. In addition one must buy a water right from the Government. This will cost between \$65 and \$70. The purchaser must live upon his lands until this water right is paid for and such payments must be made in installments annually for five or ten years, as the Secretary of the Interior may fix. This has not been settled, but it is probable that it will be upon the ten year basis.

The soil is volcanic ash and varies from a few inches to several feet in depth. The subsoil is gravel beds, or in some parts, cement gravel.

The farm unit is 40 acres.

Altitude 1250 to 2000 feet. Rainfall, 6 inches. Temperature, zero to 100 deg.

North Yakima, Ellensburg and many other towns are in this zone and the Northern Pacific Railroad traverses it.

In the spring there are many disagreeable dust storms. During the winter high winds are rare. There is usually a few inches of snow each winter.

The products are deciduous fruits, berries, vegetables, hay, grain and hops. The market is the East, Puget Sound cities, Europe and Alaska.

It is best not to try to make a start here with less than from \$1500 to \$3000 capital.

Wapato Project.

The irrigable land in this project is all embraced in the Yakima Indian Reservation and includes some 120,000 acres susceptible of irrigation.. Of this amount about 17,000 acres are now receiving water during the high water periods through the reservation canals which were constructed with tribal funds.

These old canals will be enlarged and utilized and the water will be taken from Toppenish and Santas creeks, supplemented by a reservoir impounding 200,000 acre-feet in Yakima Lakes.

In accordance with an act of Congress of March 6, 1906, this land was withdrawn from settlement pending the construction of the Government system of irrigation for Indian lands.

A tract of 20 acres in each allotment will be held by the Indian having such allotment and he is authorized to sell the remainder of same. The proceeds of these sales will be used to pay the charges which may be assessed against the lands held by the Indians.

The lands will not be opened for settlement until there has been a complete adjustment of all questions involving water rights and allotments.

The soil and transportation facilities are equal to the best in the Yakima Valleys and the altitude, rainfall and climatic conditions are similar.



Cherry Orchard on the Yakima Project.

Wyoming

Shoshone Project.

(Write U. S. Land Office, Lander, Wyoming.)

As developed to this date this project contemplates the reclamation of 120,000 acres to the north and 30,000 acres to the south of the Shoshone River, about 75 miles east of the Yellowstone National Park. An impounding dam is to be constructed at the head of the canyon through which the river flows, and a reservoir with a storage capacity of 456,000 acre-feet to be so established.

The soil is light sandy and clay loams, and with ample water, alfalfa, hay, grain, and the hardier fruits and vegetables can be grown abundantly.

Ninety per cent. of the area is public land. The land near Cody, Wyoming, is now subject to entry under the homestead laws only. The farm unit is from 40 to 160 acres.

The water cost is \$45, payable in ten annual installments. There is a further maintenance charge of \$1.00 per acre.

Ten years' residence is required.

The elevation is 4100 to 4400 feet, and the temperature seldom goes below zero or above 95 deg. in summer. Temperature, from 20 deg. below zero to 96 deg. above. Rainfall 6 to 10 inches.

Well water is reached at from 30 to 50 feet.

Cody, Garland, Powell and Ralston are the principal towns.

A branch of the C. B. & Q. traverses the project.

The settler should have at least \$1000 capital to succeed.

Irrigation Projects of the State.

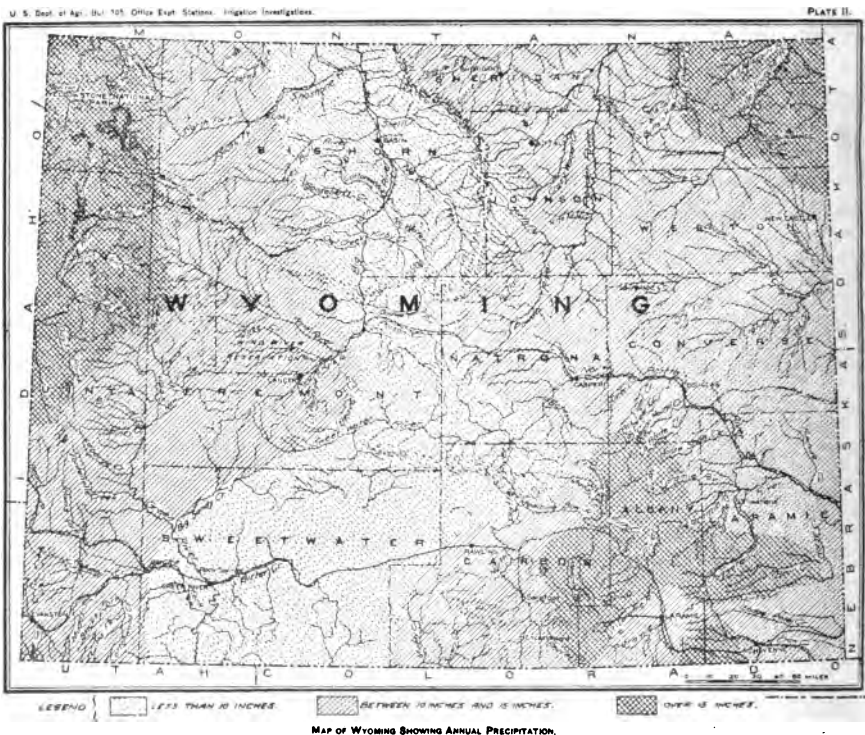
The following information has been taken, with a few additions, from a publication of 1908, issued by authority of the State of Wyoming, and furnished by the State Engineer. It sets forth briefly the conditions obtaining within that state as regards the acquirement of irrigable and other lands.

State Lands.

The State of Wyoming has a little over three million acres of land granted for the support of the common schools, and also receives five per cent. of all money received by the general government for the sale of lands in Wyoming. The State also has nearly seven hundred thousand acres of land granted to the support of the various institutions.

The State Land Board does not offer these lands for sale unless such sale seems to be to the benefit of the State by offering opportunities for home making or employment. When sold upon approved applications, the lands are offered at public auction and cannot be purchased for less than ten dollars an acre. Thirty per cent. of the purchase price must be paid in cash, and the balance, if desired, may be paid in seven annual payments, with interest at six per cent.

In order to secure revenue for the common schools and the various State institutions, the Board leases the State Lands to parties making application for same, preference in original applications being given to residents of the State. After lease has been secured, the party is entitled to a preference right to a renewal of same at the end of five year term, at such valuation as may be fixed by the Board. Most of the grazing lands are rented for five cents per acre per



year. Lands susceptible of irrigation run from ten to fifty cents per acre per year, while indemnity school lands selected in the place desired by the applicants bring rentals of from ten to twenty-five cents an acre.

Information in regard to the lease of State lands can be secured by applying to the Commissioner of Public Lands, at Cheyenne.

State Coal and Mineral Lands.

The State has a number of school sections containing mineral leads and valuable deposits of coal, which deposits were not known to exist in 1890, at the time of the passage of title from the United States. These sections can be rented and mined upon a royalty basis, but a sufficient deposit is required, so that the lands will not be held for speculative purposes. Full particulars in regard to the lease and sale of these lands can be had by applying to the Commissioner of Public Lands, Cheyenne, Wyoming.

The Carey Desert Land Act.

"How to Obtain a Home."

Under the provisions of the Act of Congress, approved August 18th, 1894, donating to each of the arid land states one million acres of land, conditional upon its reclamation, the State of Wyoming has segregated forty-three tracts of land, aggregating nearly seven hundred and fifty thousand acres. In addition to the three hundred and twenty acres of land allowed by the government under the homestead and desert land laws to a qualified party, such party may also file upon one hundred and sixty acres under the Carey Act, providing that he purchase a water right from the association or company constructing a canal for the reclamation of the land, at a cost of from ten to forty dollars per acre, depending upon location. Not more than one-quarter of the purchase price can be required in advance from the settler, the remainder being payable in ten equal annual installments, with interest at from six to eight per cent. per year. The settler has the privilege of paying all in cash if he so desires, or paying in full at the time fixed for any partial payment. Parties desiring to take up homesteads under this act are requested to write to the Commissioner of Public Lands, Cheyenne, who will be glad to give specific information in regard to any project, or to address the companies which have been granted contracts for reclamation, as shown in the following pages. Water rights to all lands acquired under the provisions of this act attach to and become appurtenant to the land. A payment of twenty-five cents per acre must be made at the time of making application for the land, and a fee of \$1 paid; within three years the applicant must show reclamation of one-eighth of the land and a continuous residence after the first six months. Application for patent must be accompanied by the final payment of twenty-five cents an acre and a state fee of \$2.00 for issuing the patent. If the land is reclaimed within the first six months, upon the showing of the construction of a substantial house and a residence of not less than thirty days immediately prior to the date of making final proof the applicant may procure a patent for the land and may obtain such patent at any time after six months, upon making the proper showing.

The State Land Board does not allow a canal company to sell water rights until its canal is completed to the point of diversion of the water contracted for, unless it is provided that the contract and money, or evidence of indebtedness, are deposited with the application of the settler and the proper fees, in escrow in the office of the Commissioner of Public Lands, there to be held until the canal is ready to deliver water. This allows the settler to begin the improvement of his land in the season prior to the anticipated completion of the canal, so that when the canal is ready to furnish water, he is ready to put in a crop and make his final proof the same season.

A party having an uncompleted homestead entry under the United States law cannot make application for lands under the Carey Act until he is in position to make his home upon the land.

Disposition of Money.

The fifty cents per acre received by the State for these lands creates a fund for the reclamation of other lands, which is deposited in the State Treasury pending the accumulation of the amount sufficient to finance some reclamation project.

What Has Been Done—Canals Constructed.

The Arid Land Act is now proving to be the most beneficial to the State of Wyoming of all United States laws, as Wyoming has more streams than any other Western state.

The State Land Board has taken especial and practical interest in furthering the interest of the settlers. The state and national governments afford perfect protection for capital invested and to the settler for title to his land and the perpetuity of his water right. There is no possibility of loss to the individual investors or the settlers. The soil, climate and altitude of Wyoming are especially adapted to the most profitable crops grown by irrigation.

Cody Canal Company.

Cody, Wyoming.

The first segregation made under this act was for the Cody Canal, and comprised 26,429.94 acres, the water being taken from the south fork of the Shoshone River. The State obtained patent to 19,868.54 acres, about 12,000 acres of which have been filed upon and reclaimed. This canal has been turned over to the management of holders of water rights therein, and will be a splendid success under co-operative management. A number of valuable tracts are still open for entry.

By reason of the proximity of the lands to the prosperous town of Cody and to the work being done by the United States Reclamation Service in the construction of the Shoshone Canal on the north side of the river, settlers can find work for themselves and market for the products of their farms.

Only a visit of inspection to this tract and a comparison of the reclaimed lands with the unbroken desert lands adjoining will enable the prospective settler to realize the results obtained by the few years' work.

Big Horn Basin Development Company.

Germania and Wiley, Wyoming.

The State has received patent for 11,251.60 acres under the Bench Canal, constructed over ten years ago by this Company. Nearly one hundred families settled under this canal and most of the land is now patented to the settlers. The canal is under the control and management of the owners of shares therein and the cost of maintenance is about \$7.00 for each forty acre tract per year.

This company has also segregated 204,620.53 acres under what is known as the Oregon Basin Reservoir and Canal Project. For the purpose of diverting the flood waters of the South Fork of the Shoshone River, a canal sixty feet wide is being excavated which will carry a small river into the immense reservoir known as the Oregon Basin. This is one of the largest projects in the State and is, in many ways, superior to the government projects which have been more costly.

At the point where the water from the canal enters the Oregon Basin Reservoir, a fall of 130 feet offers an opportunity for the creation of an enormous amount of electrical energy, which will inure to the benefit of the residents of the new town of Wiley, located near this point, and the settlers on these tracts of land, as electricity can be transmitted to all points. Adjoining the lands are coal measures, which offer a cheap fuel, a most important item in the settlement of a new country.

The Big Horn Basin Development Company, being unable to complete the tunnels and headgate of the Shoshone River Canal, were not able to deliver water as advertised, on May 12th, 1908.

The Land Board has ordered that all the money paid by prospective settlers and the contracts entered into between settlers and the company be placed in escrow in this office to be held here until the company is ready to deliver water contracted for. Parties can thus select the lands they desire to enter and be ready to locate upon them when notified that water is ready, and be protected by the state holding the money and contracts.

Further inquiries in regard to this plan will be answered upon request.

The prosperous towns of Germania and Burlington have been built up by the settlers under the Bench Canal.

A large amount of honey is produced on the Germania Flats, and in some cases the settlers have paid for their lands from the labor of their bees.

This company also has a small segregation of 784.43 acres taken up under water rights from Sage Creek. This canal was constructed and has been enlarged and absorbed by the Oregon Basin Canal Company.

Big Horn County Irrigation Company.

Basin, Wyoming.

A segregation of 16,295.44 acres of land on the west side of the Big Horn River south of Basin was made several years ago which has been supplemented by additional segregations aggregating between 5,000 and 6,000 acres, so that this company now has open for settlement about 22,000 acres of valuable land, and has expended over \$360,000 in the construction of a substantial canal. The elevation of these lands is but a little over 4,500 feet, and the lands are particularly adapted to the growing of sugar beets.

This segregation is tributary to the county seat, Basin, a prosperous town

with good stores, banks and lumber yards, and which will offer a market for the surplus products of the settlers. None of the segregated lands are more than three or four miles from the Burlington Railway, which offers an outlet for the stock-raisers and feeders.

The canal system is entirely completed, and many settlers have taken up tracts of land along the Big Horn River. The company expects to entirely settle these lands during the present year, and, on account of the proximity to the railroad and to the markets of the coal mines and towns along the Burlington, there would seem to be no better location in the State.

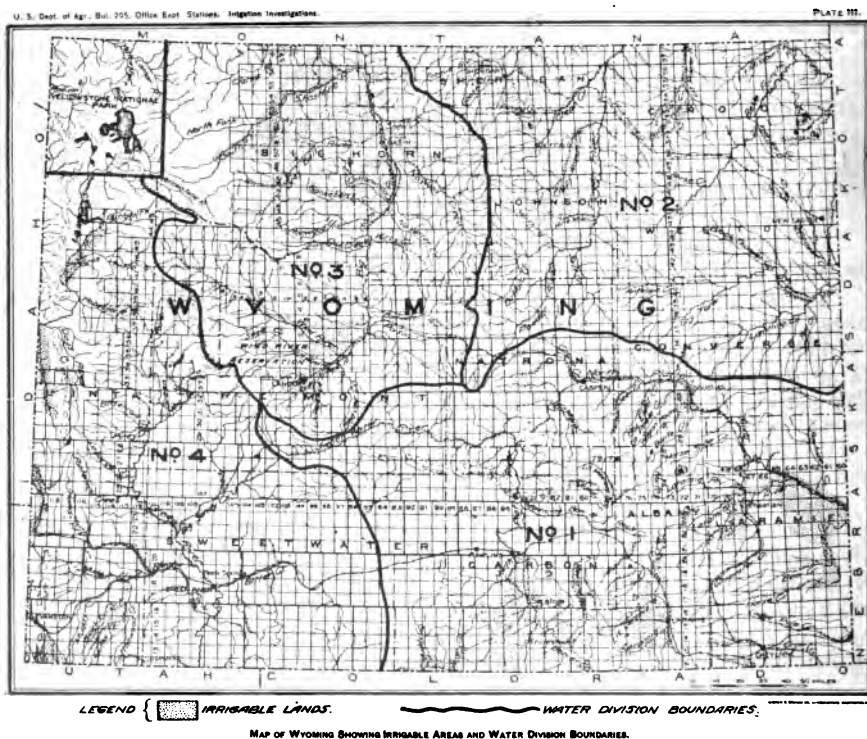
Hanover Canal Company.

Worland, Wyoming.

This company has a segregation of 10,682.53 acres, and has, in addition, about 20,000 acres of deeded lands which can be sold outright with perpetual water right.

The town of Worland is near the north end of these lands, and a new town of Rairden is near the southern end, most of the land being on the east side of the Big Horn River. The tract is traversed by the Burlington railroad, and prospective settlers can examine the lands from the train.

This company is now constructing a steel flume across the Big Horn River, and is ready to deliver water to several thousand acres of valuable farming



land not yet filed upon. There is a market at the Kirby mines for a large amount of agricultural products, and this tract offers exceptional advantages to the homeseeker.

**The North Platte Canal and Colonization Company.
Wyncote, Wyoming.**

This company had a contract to reclaim 14,424.44 acres of land along the North Platte River in Laramie County. The Government Reclamation Service found it necessary to purchase its canal and enlarge same in order to be able to carry water further down to government lands. A very large and substantial canal has been constructed and the bulk of the land has been filed upon. There are, however, a number of very desirable homestead locations left, for which water rights can be purchased at \$30.00 per acre.

The prosperous settlements of Fort Laramie, Wyncote and Torrington are in the vicinity of the lands covered by this canal, and offer trading and school advantages.

On account of the proximity to the Denver and Omaha stock markets, these lands are particularly desirable, as all forage crops meet with ready sale to stock feeders.

Beet sugar factories will, no doubt, be erected in the near future in close proximity to this section, the soil being particularly adapted to the raising of sugar beets, and settlers will find a ready sale for their reclaimed lands in the future.

**The Wheatland Industrial Company.
Cheyenne, Wyoming.**

This company has completed an extension of the Wyoming Development Company's canal, which is an immense system constructed several years ago for lands taken up under the Desert Land Act before the passage of the Carey Act. The branch canal is controlled under a separate corporation, and will be turned over to the management of the settlers when ninety per cent. of the lands are taken up. The lands will be open for settlement May 1st.

The town of Wheatland is located on the Colorado & Southern Railway near the center of the irrigable tract and offers advantages in the way of schools not always found in a more populous district. Flour mills are ready to purchase all the grain raised and live stock feeders use the alfalfa and other forage. Parties taking up land under the Carey Act who desire to obtain more than 160 acres can purchase other lands outright from the company. The price of the water right is \$37.50 an acre.

**Sahara Ditch Company.
Buffalo, Wyoming.**

The segregation of 7,920.30 acres was made for this company in the Southern part of Johnson county along the Powder River. This county was among the first counties settled up in the northern part of the state, and is a great stock raising district and one of the most fertile and prosperous counties in Wyoming. In spite of the fact that it lacks railway communication, the county seat being thirty miles from the Burlington road at Clearmont, it has rapidly developed, and the lands under this canal, for which water rights can be secured at not to exceed \$30.00 per acre, offer such advantages that they should be investigated by prospective settlers. The altitude is comparatively low, ranging from 4,000 to 4,600 feet, and almost all crops can be grown in this

county. Much land is suitable for fruit raising, and with the prospective development it is but a question of time when the county will be traversed by a new railroad or a branch of the Burlington.

**La Prele Ditch and Reservoir Company.
Douglas, Wyoming.**

This company has constructed a canal sixteen miles long at a cost of about \$120,000.00, and is contracting for the construction of a reinforced concrete dam to impound the flood waters of La Prele Creek, at a cost of about \$190,000.00

About twenty thousand acres of land near Douglas in Converse County has been segregated under the Carey Act, and a considerable area of deeded homestead lands will also be supplied with water through this canal from the reservoir.

The segregated lands extend to within three miles of the city of Douglas, one of the most prosperous and beautiful towns in the State, which offers a market for all the alfalfa and grain that can be raised by the settlers. The State Fair located here offers an excellent opportunity for the exhibition of the local products, and land values will advance rapidly. Being adjacent to the Chicago & Northwestern Railroad, which offers ample facilities for stock shippers, there is no doubt that a great shipping and feeding business will be established in this vicinity.

This company has also made plans for the segregation of another tract which will eventually add a considerable area to the farming lands of Converse County and aid in keeping it as it is now, one of the foremost counties in the State.

**Big Horn Basin Colonization Company.
Bryon, Lovell and Cowley, Wyoming.**

The three prosperous villages of Bryon, Lovell and Cowley have been built by Mormon colonists, and the settlers, as a rule, live within the village limits, cultivating the land from three to five miles in each direction during the days and returning to their homes in the evening. The work of these pioneers is an object lesson and testifies both to the advantages of irrigation and the industry of the settlers.

This company has had segregated some 20,000 acres of land, almost all of which has been filed upon and reclaimed by actual settlers. The land is situated near the Shoshone River and the canal was built under the co-operative plan and has been very successful. Almost every variety of grain grown in the West can be grown here.

**Boulder Canal and Reservoir Company.
Boulder, Wyoming.**

This company has completed a canal for the reclamation of 6,120 acres of land in the southwest portion of Fremont County. On account of the distance from railroad communication, the cost of water rights has been placed at a very low figure. Parties desiring to make their homes there can settle upon 160 acres of land and purchase a water right for \$10.00 an acre. The land is very fertile, and, within a short time, will be within reasonable distance of railroad transportation and will then be worth at least three times the present price. This is one of the best stock growing localities in the state, and, being near the mountains, the climate is very delightful.

Lovell Irrigation Company.

Lovell, Wyoming.

On the south side of the Shoshone River this company proposes to reclaim 11,320.51 acres of land. A number of miles of this canal have been completed, but the land is not yet open for settlement.

NEW CANALS IN COURSE OF CONSTRUCTION.

The canals and segregations hereinbefore specifically mentioned have been partially or fully completed. There are a number of projects which have not been completed and some not yet started, which will reclaim lands in various parts of the state.

North Platte and Encampment Canal Company.

Encampment, Wyoming.

This corporation has two segregations of land aggregating nearly 50,000 acres lying between the towns of Saratoga and Encampment on the west side of the North Platte River in Carbon County. Some preliminary work has been done. A railroad is now completed from Walcott on the Union Pacific to Saratoga, and will soon be completed to Encampment.

Western Land and Irrigation Company.

Saratoga, Wyoming.

This company has a segregation of 18,171.27 acres lying on the east side of the North Platte River in Carbon County. The project is entirely feasible but the construction has not yet been commenced. The opening of the railroad mentioned above will no doubt encourage capital in beginning the work.

Eden Irrigation and Land Company.

514 Boston Building, Denver, Colorado.

This company has had two segregations of land made, aggregating 92,606 acres. The lands lie between and along the Little and Big Sandy rivers in Fremont and Sweetwater counties, and in a section of great agricultural possibilities. The company has secured the necessary capital for construction of its system, and is now prepared to locate settlers on this land under what is known as the escrow agreement, all money paid for water rights or contracts entered into being held in the office of the Commissioner of Public Lands at Cheyenne, until the Canal is ready to deliver water. The settlers can procure work on the canal, or be improving their claims until such time as water for irrigation is delivered, and should the company fail to carry out its contract, the money will be returned to the prospective settlers. (See Sweetwater County.)

Medicine Wheel Canal Company.

Basin, Wyoming.

This company has a segregation of 22,522.64 acres of land on the east side of the Big Horn River, north of Basin. The segregation has just been allowed by the government, and construction work will probably commence during the present season.

Hubbard Canal Company.

Cheyenne, Wyoming.

A segregation of 36,621.14 acres has been applied for by this company, being land to be reclaimed from the Clark's Fork River in Big Horn County.

This is a particularly valuable tract of land, and, as soon as the segregation is allowed, the company will commence construction.

Paint Rock Canal.

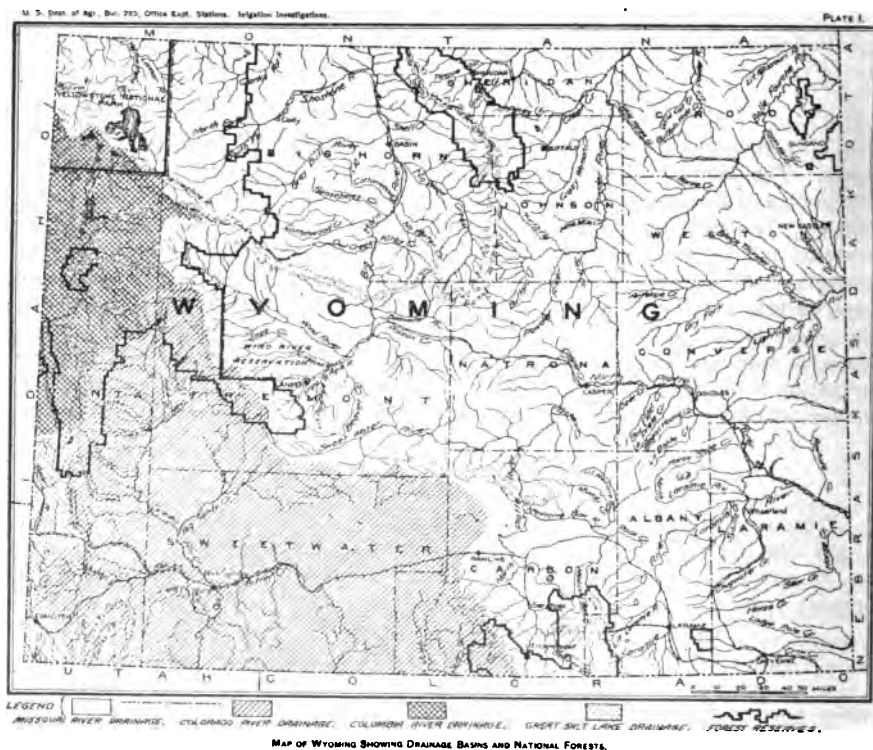
1422 Marquette Building, Chicago, care Wm. T. Rohrer.

This company has two segregations of land aggregating about fifty-four thousand acres, the water being taken from Paint Rock Creek, a branch of the Big Horn River east of Basin. Active operations began this spring, a large amount of machinery having been shipped in for use in digging the canal. It is not probable that any water can be furnished for at least a year, but the company will allow prospective settlers to file upon tracts of land and deposit their payments in the office of the Commissioner of Public Lands in escrow, to be held until the canal is completed to the point of diversion of the water contracted for. This plan enables prospective settlers to place their lands in shape and construct the necessary improvements so that when water is ready they can put in a crop and make their proof of reclamation.

The Hammit Ditch.

Cody, Wyoming, care of J. W. Schwoob.

This company has applied for a segregation of about 7,000 acres of land in the Big Horn County, near Cody. Its water right is one of the oldest in existence from the south fork of the Shoshone River, and, by reason of the proximity



of the lands to the lands already irrigated under the Cody Canal, and the town of Cody, prospective settlers would find it greatly to their advantage if they could secure one of the homesteads thereunder. The land will not be open to settlement before 1909, except under escrow agreement.

Lake De Smet Project.

A large amount of land in Johnson and Sheridan counties was withdrawn by the government for investigation by the Reclamation Service. The project not being undertaken by the United States, the land has been released, and an association of western capitalists has taken it up and will, by including the reservoir capacities of Lake de Smet, a natural lake in the adjoining mountains, and the construction of a ditch to carry water to supplement the natural flow of Piney, Prairie Dog and other small creeks in Sheridan County, be able to supply water for the reclamation of many thousand acres of very valuable land in Johnson and Sheridan counties. Most of the land is already owned by private parties, but will, no doubt, be placed upon the market when it is found that water for irrigation can be supplied. A number of thousand acres of state school lands can be irrigated and will be placed on sale after the canal is completed.

The Fetterman Canal. Douglas, Wyoming.

One of the large private enterprises is the canal constructed to cover some 6,000 acres of land west of Douglas, including lands in what is known as the "Old Fort Fetterman Reservation." A large canal has been constructed at a cost of over \$80,000.00, and is ready to deliver water. The land under this canal is mostly in private ownership, and under the control of Mr. John Morton of Douglas, Wyoming, who has during the present season, put over 1,000 acres in crops. The land is mostly level and very fertile. The Chicago & Northwestern Railroad passes through the tract, as does the survey of the Burlington Railroad.

Rock Creek Ditch and Reservoir Company.

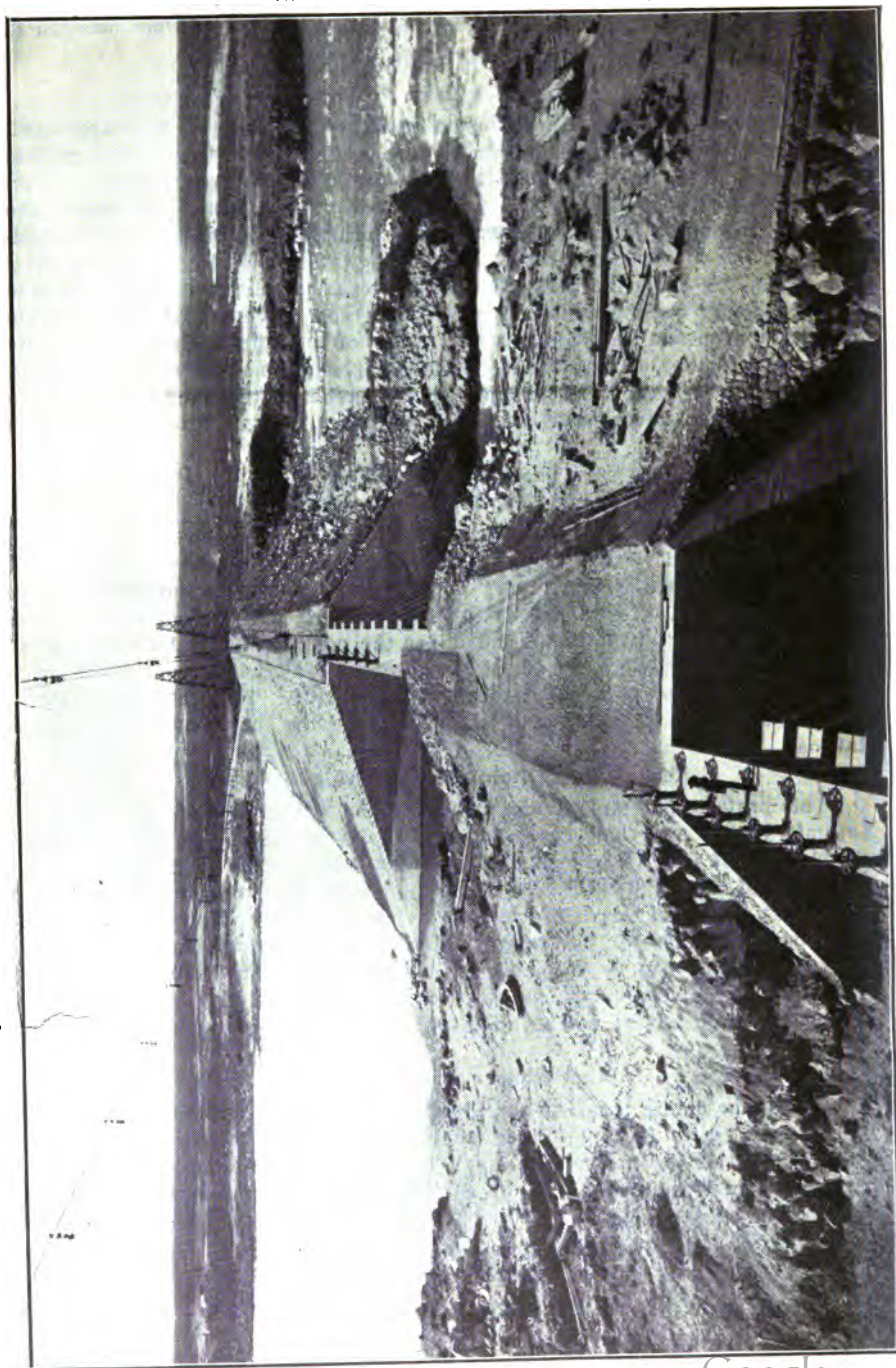
This project contemplates the storage of the waters of Rock Creek, on the Laramie Plains, and their utilization in the development of a tract of about 50,000 acres of fine irrigable lands, which have been used for many years as the range of the Diamond Cattle Company, one of the largest of the old time companies. Much of this land has been irrigated for the purpose of increasing the growth of grass for pasturage. There is a considerable area of government land which can be taken up by settlers, while the deeded land of the company and the state lands can be purchased. The company is not yet ready to furnish water, but by writing to them at Bosler, Wyoming, information can be secured.

The Pioneer Canal Company.

One of the oldest canals in the State is the Pioneer Canal Company, which built a canal from Laramie River and furnishes water to settlers who have taken up land on the Laramie Plains. There are still some opportunities to secure land under this canal, and, by writing to the company at Laramie, information can be secured.

The Talmadge-Buntin Land Company. Bosler, Wyoming.

This company has an irrigation project under way.



Minidoka Project, Dam and Regulating Devices

United States Reclamation Service

Various Irrigation Projects Not Heretofore Referred To.

(Write U. S. Reclamation Service, Washington, D. C.)

ARIZONA.

The San Carlos Project contemplates a reservoir on the White Mountain Indian Reservation on the Gila River below the mouth of the San Carlos Creek. The water will be impounded by the construction of a dam and it is estimated the reservoir will have a capacity of 240,000 acre-feet.

This water can be used to supplement the minimum flow of the Gila, and through that river channel, can be conveyed to the rich land in the broad valley near Florence and on the Gila River Indian Reservation near Sacaton.

CALIFORNIA.

The Sacramento Project is indulged with the object of placing the entire Sacramento Valley under irrigation to the extent that is practicable without rendering the river unnavigable. Nearly 2,000,000 acres of this land are above overflow and about 40,000 acres have already been irrigated. Six reservoir sites have been selected—five of which are on the Pitt River and one at Iron Canyon near Red Bluff on the Sacramento. These reservoirs are to be used to supplement the river's usual flow.

Owens Valley Project contemplates the drainage, storage, and pumping of water on the eastern slope of the Sierra Nevadas in Inyo County. This water should serve 80,000 acres.

COLORADO.

The White River Project has in mind the reclamation of 90,000 acres in Rio Blanco and Routt counties through canals that will convey the water of the White River from a point about thirty miles above Meeker, Colorado.

IDAHO.

The Dubois Project in the Snake River Valley is intended to reclaim about 200,000 acres of desert land (subject to entry) by means of a canal system having its headgates near St. Anthony.

MONTANA.

The Marias Project includes the construction of an earthen dam in the Sandstone Canyon of the Marias and the impounding of about 450,000 acre-feet to serve the nearby lands through an extensive canal system.

The Clark Fork Project embraces lands in the valley of the Clark Fork River near the zone of the Shoshone Project. An extensive canal and storage system will be necessary and owing to the cost will doubtless not be undertaken for some years.

The Madison River Project has as its zone about 150,000 acres in the valleys of the Madison and the Missouri in Western Montana. The plan contemplates

the construction of a storage reservoir in the Madison River Canyon to impound water which will supplement the natural flow. The water will be diverted by a weir dam at a point about seven miles below. From here by a system of canals and syphons the water will be conveyed for about forty miles to the lands to be served.

In addition the United States Reclamation Service is constructing for the Bureau of Indian Affairs, the Blackfoot Project (30,000 acres), and the Flathead Project, (available area, 130,000 acres). Surveys are well under way, and construction will begin in 1909.

The Fort Peck Project (100,000 acres irrigable). Construction will begin season of 1909.

NEW MEXICO.

The Urton Lake Project has as its zone the lands of Guadalupe and Chaves counties. Through the impounding of flood waters in a large natural basin by means of a dam and by the construction of a canal some thirty-five miles in length about 60,000 acres may be reclaimed.

The Las Vegas Project is on the "Las Vegas Grant." It is the purpose to convey the water through canals to a point a few miles above the town of Las Vegas and there impound it by constructing a dam in an arroyo.

The La Plata Valley Project in San Juan County contemplates the reclamation of 50,000 acres of northwestern New Mexico lands.

NORTH DAKOTA.

The Bismarck Project near Bismarck contemplates the storage of water at a high line reservoir to serve between 10,000 and 15,000 acres. A pumping plant and a canal system will be necessary. The lands in some cases are sixty-five feet above the river surface.

OREGON.

The Malheur Project has as its object the reclamation of 90,000 acres in the valley near Vale, through the storage of the flood waters of the Malheur River, and

The Owyhee Project being immediately south is closely allied. The lands to be served lie along the Snake River and extend into Idaho.

UTAH.

The Utah Lake Project refers to the reclamation of southern Salt Lake and Utah Lake valleys.

The Bear Lake Project deals with lands on the border between Utah and Idaho. It is not probable that this will be undertaken for some years.

WASHINGTON.

The Leadbeater sub-project is allied with the Yakima Valley and Sunnyside projects, and has similar conditions.

The Priest Rapids Project has as its zone 160,000 acres of desert land in Douglas, Benton and Franklin counties in central Washington. Pumping plants, storage reservoirs and a gravity canal system will be necessary.

The Big Bend Project through the diversion of water from the Spokane and Coeur d'Alene is intended to irrigate lands in the Big Bend of the Columbia River.

The Palouse Project includes 100,000 acres near Pasco, between the Snake and Columbia rivers. A storage reservoir will impound the Palouse River waters and canals will convey it to the lands.

Canada

Alberta Project.

(Write Supt. of Irrigation, Calgary, Alberta, B. C.; Canadian Pacific Irrigation Colonization Co., Calgary, Alberta, Canada.)

It is estimated that there are 170,000,000 acres of unoccupied arable land in Canada, much of which is capable of producing twenty crops without diminution.

Much of this territory is so situated that the growing season is short and the gaining of mature crops is therefore uncertain.

The Canadian Pacific Railroad traverses a tract in Alberta which extends for 150 miles eastwardly from Calgary and averages 40 miles in width. This area includes approximately 3,000,000 acres, of which 1,500,000 is being irrigated. One million acres was open to settlement in April, 1908.

The land is the property of the Canadian Pacific Railway and is being sold



Headgates at Main Intake: Alberta Project.

to settlers at from \$18 to \$25 per acre for irrigated and \$10 to \$15 for non-irrigable farms, upon a basis whereby the purchaser may pay in six annual installments (with 6% interest on the deferred payments) if he does not become a settler; or is given a relatively lower basis and ten years to make final payment if he settles and cultivates the land for three years.

There is no charge for water rights.

The Canadian Government owns the irrigating system, taking the water from the Bow River and charges 50 cents per acre per annum for the water delivered by canals to the land. This charge is made whether water is actually taken or not.

The soil is black, sandy loam. It is about one foot in depth and has a three foot clay subsoil.

The crops are alfalfa, vegetables, wheat, oats, barley and flax, and the net profit figures from \$7 to \$11 per acre.

Altitude, 2400 to 3300 feet.

The rainfall is about 19 inches. Temperature, maximum, 108.20; minimum, 50.70 below zero.

The average mean temperature for eight years ending 1905 was 37.40 deg.

Langdon, Strathmore, Calgary, Bassano, Gleichen, Namaka, Medicine Hat, and Cluny are towns on the project.

It is not advisable to go there unless one has at least \$1000.

One cannot buy less than 40 acres. No tract of more than 640 acres may be obtained unless special arrangements are made.



Alberta Project. Main Canal three miles from the intake.

CANADIAN LANDS.

It is of such general interest that mention must be made of a large tract of Canadian land which is now available to settlers.

While this is not irrigated land, yet the homeseeker should be advised concerning it as it offers unusual opportunity to the agarian who is hardy and is not afraid of extremes of cold.

The tract contains 28,000,000 acres of rich arable land in the odd numbered sections of Western Canada. None of this land is irrigated.

Unlike former Canadian land offerings, the settler is not obliged to go into the wilderness. The requirements for homesteading are six months' residence in each of three years. He must become a naturalized citizen. It is also required that he build a habitable house and farm buildings on the property he claims.

There is no specification as to the number of acres he must cultivate. This is a matter to be passed upon and decided by the Minister of the Interior.

Residence of a homesteader at the home of a relative within nine miles of the homestead is taken as residence on the farm. The term of forfeiture of the right to homestead for failure to apply for letters patent is fixed at five years.

This area is thrown open under the Oliver Land Act, which became operative on Sept. 1, 1908. It is about 300 miles wide from north to south and about 350 miles from east to west.

It is situated west of the Soo Railway and along the line of the Canadian Pacific.

DEPARTMENT OF THE INTERIOR, CANADA.

Ottawa, August 21, 1908.

Sir: In reply to your letter of the 11th instant, I beg to say that an Act was passed during the session of Parliament just closed which is intended to permit homesteaders to acquire an additional 160 acres of land adjacent to their homesteads on certain conditions as a pre-emption at the price of \$3.00 per acre, payable, one-third three years from date of entry, and the balance in five equal annual installments with interest at 5% per annum on any amount remaining unpaid from time to time.

I am sending you, herewith, a map showing the area within which homesteads and pre-emptions may be acquired. This Act comes into operation on the 1st of September next, by which date it is expected the Department will be in a position to supply all applicants with printed information.

Your obedient servant,

Chas. R. Price, Esq.,
Lankershim Building,
Los Angeles, Cal., U. S. A.

P. E. KEYES,
Secretary.

California-Mexico

Imperial Valley Project.

(Write U. S. Land Office, Los Angeles, Calif.; California Development Company, Calexico, California; Imperial Land Co., Los Angeles, Calif.)

There are approximately 400,000 acres of land in the basin of the Colorado River Desert in southwestern California that may be reclaimed by irrigation.

Practically one-half of this area is now under irrigation and the settlers there have made such marked successes as to make this project of great value as illustrative of what irrigation and the resulting high intensive cultivation will accomplish in lands that have at least equal conditions.

The water has been conveyed to the land through syndical enterprise and the original land holders gained their first title from the Government under the desert land laws.



Imperial Valley Project.

The land that is capable of being irrigated from the canals now constructed has long since been claimed and is held at prices that in many instances figure several hundred dollars per acre.

Subsequently other canals will be dug and the best lands that they will water have already, in many instances, been claimed by settlers who wish to profit by the great enhancement when the water is in shape for delivery.

The soil varies greatly, ranging from adobe and clay to loam of a sandy character. It is very fine in texture, having been formed by the gradual deposit of river silt.

This very fineness, coupled with the natural dryness, makes the dust-storms that high winds bring with them, one of the settler's discomforts.

This soil is of known depth varying from some few to several hundred feet, and in places is highly alkaline.

The water is taken from the Colorado River in Mexico and conveyed by canals to the ground.

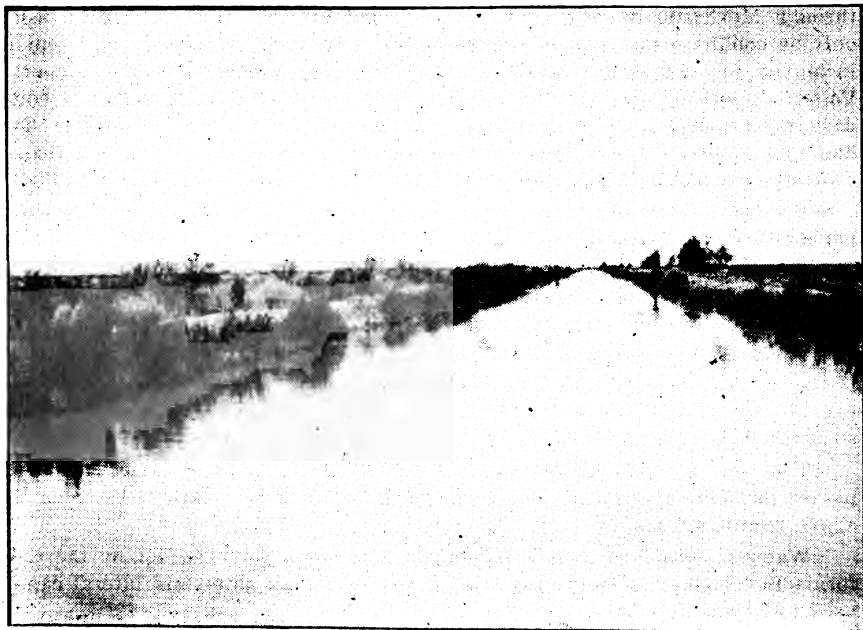
Temperature ranges from 24 degrees to 125 degrees. The valley is all below sea level. Rainfall, about $4\frac{1}{2}$ inches.

Imperial, Calexico, Brawley, El Centro, Holtsville and Heber are the principal towns.

The Southern Pacific traverses the valley.

The conditions south of the Mexican line at this location are virtually the same, the soil as rich, irrigation as easy and many thousand acres of land of this same character, and really a part of the same valley, lie in Mexico.

The charge for water stock is \$25 per acre and this is liable to be advanced.



Main Canal: Imperial Valley Project.

The water rental has been 50 cents per acre foot, but this rate also may be raised.

The settler is required to own a share of stock (\$25) for each acre he cultivates and a minimum charge for one acre-foot is made whether he uses it or not.

He is also assessed for maintenance at the rate of \$1.70 per acre per year.

The quantity of public land that one may claim was formerly 320 acres, but this has now been limited to 160 acres. He must comply with the homestead laws as to residence.

There is no limit to the deeded land that an individual may hold and residence on deeded land is not required.

LOWER CALIFORNIA.

(Write the California-Mexico Land and Cattle Company, Los Angeles, Cal.)

Of the near million acres of land in the Colorado River Delta, in Lower California, two-thirds can be irrigated from the river, and that part of the large area is the very best sedimentary deposit brought down from the northern hills by the mighty river at flood times, rich in all that makes for plant life.

The topographical conditions are such that the Imperial Valley, in the United States, can only be irrigated from the Colorado River by carrying the water through Mexican territory. The concession to the California Development Company by the Mexican Government, which permits water to be taken through Mexico to irrigate land in the United States, grants such permission only on condition that half of the water taken through the canals shall remain in Mexico to irrigate Mexican lands. It is therefore evident that the "Imperial Valley" is located one-half north and one-half south of the international boundary line separating the United States of America from Lower California. The half lying south of the boundary line is all above sea level and for that reason a little more desirable, the soil tending more to a sandy loam with less alkali.

Mr. J. Garnett Holmes, Assistant of the Bureau of Soils, United States Department of Agriculture, makes the following report on these lands:

"I can most emphatically state, taking into consideration the climate and water supply, that this is the best large body of virgin land yet encountered in the work of our Bureau."

There is only one serious objection to this section of fertile country—that is the high temperature for three months in the year. The temperature, however, is not so high as that of the San Joaquin and Sacramento valleys, where so much of California's fame as a productive state has been made.

The new line of the Southern Pacific Railroad from Calexico to Yuma passes through this part of Lower California and has five stations between the above mentioned points.

Water is furnished to land owners at fifty cents per acre-foot by the California Development Co., the land owner paying for all gates and lateral canals used to irrigate his land.

Land can be purchased or leased in large tracts, on advantageous terms, by responsible parties.

Mexico

MEXICO'S AGRICULTURAL DEVELOPMENT.

The fertile lands of Mexico have always produced the most bounteous and varied of crops in spite of the constant efforts of the native farmer to kill them by the worst methods of farming known to mankind.

With a single-handled, wooden-bladed plow, armed with a long goad, he prods his slow-footed, cloven-hoofed oxen over the fields and scratches the surface to form a bed for the grain that he scatters. This, however, is only when he waxes energetic—usually he regards the preparation of the soil a useless formality, and his "farming" consists of the throwing of seeds upon the ground.

His seed is never good. He knows nothing of the science of horticulture and plants the same seed on the same land in endless succession.

In a thousand ways he offends the ideas and the practices of the American farmer, yet his yields are always so large that one cannot help estimating how they would be manifolded by the application of the simple rules of the modern planter.

The crops from his lands are most varied—the products which we know, so mingled with the strange-named ones as to make us skeptical that one soil could produce them all. Vanilla, wheat, coffee, tobacco, oranges, corn, beans, manioc, sugar, lemons, aguacates, plums, chirimoyas, citrons, pineapples, hay, melons and all kinds of garden vegetables and fruits, together with many other products peculiar to localities, grow and fructify in spite of the native's efforts to kill them by his spasmodic, misguided cultivation.

The climate is superb. In the northern portions it is even superior to the best in California and in the south, more tropical conditions rule as one approaches the equator. Lofty snow-capped peaks and ranges of mountains with their table-lands and elevated mesas furnish all shades of climatic conditions and ranges of temperatures, so that Mexico's products range through the gamut of all the crops of Frigid, Temperate and Tropical zones.

No country, save Japan, has made the great advancement during the last generation that our sister Republic has made, and the general improvement is noticeable in agricultural lines although this branch has lagged—doubtless because the Mexican is not naturally bucolic in his predilections.

Another cause which has entered into this is the fact that the larger portion of Mexico, like California, is semi-arid and a certainty of crops is only secured by irrigation. This has long been recognized—so long in fact that Cortez early in the fifteenth century found great fields under irrigation and likewise found evidence that this scientific practice had been in use for centuries.

Cortez was familiar with but the section of Central Mexico as marked by the plains about Cholula, but the scope of ancient irrigation is evidenced by the fact that Coronado found the lands in what we now know as the Rio Grande Valley, extending through portions of New Mexico, Texas and Old Mexico, in highest state of cultivation and thickly populated.

Our Federal ethnologists report that in the eighth century the Salt River Valley, now a part of Arizona, then a part of ancient Mexico, was likewise irrigated and densely settled.

The long series of wars of Spanish conquest and of French occupation, followed by years of internal strife, stopped all agricultural development, and old canals became ruins and silt and dust have filled them.

Under the wise policies of Diaz the country has forged ahead and peace prevails. The cities and towns hum with commercial activity. They are lighted by electricity and trolley cars dash through the streets. Telephone and telegraph wires stretch throughout the land and the Realm of Tomorrow is become the Dominion of Today.

In Mexico there are approximately 30,000,000 acres of arable land and as the total area of the country is nearly half a billion acres the farm lands are rare. The land is semi-arid, and rare as is the fertile land, much more rare is water that is needed to bring fecundity to that land.

These cultivatable tracts lie in valleys hemmed about by mountains and wide stretches of desert lands, just as they do in our own Pacific Coast sections. California furnishes a good example of conditions in Mexico—as, save for the great Sacramento and San Joaquin basin, the fertile lands about Los Angeles and the Imperial Valley sections, the great state of California is a barren waste of desert through which great mountain ranges run.

California has become prominent through the practice of irrigation and the greatness of Mexico will come from similar development.

There is scarcely a state in Mexico where an important irrigation work is not under way.

In the northern portions the work is most advanced, for there the border land marks the scenes of the united work of Americans and Mexicans.

The great Rio Grande project, which has been developed by the Reclamation Service of the United States, has within its boundaries lands on both sides of the border; and the flood waters of that river serve an area which has as its zone hundreds of thousands of rich, fertile acres extending from Elephant Butte in New Mexico through Texas to Ft. Quitman, and irrigating a strip of Mexican territory over fifty miles in length. The work is international in its scope, as much of the water rights were in the ownership of Mexicans and as the diversion was accomplished over one hundred miles north of the United States-Mexican border, the two republics are bound together in an alliance for the mutual good of their several peoples.

A second project uniting both Mexican and United States lands within its area is located in the basin of the Colorado Desert known generally as the Salton Sink and developed under the name of the Imperial Valley project. It covers about 600,000 acres, nearly half of which are in Mexico. This Imperial Valley is so well known that only passing mention need be made of it. The lands produce most of the crops grown in temperate and semi-tropical climates.

A hundred miles or more away nearly due south from Imperial, is a great delta at the mouth of the Yaqui River. It contains a million acres of land that rivals the soil of the Nile delta in fertility, and produces a wide range of vege-

table foods and fruit. It is being placed under irrigation by a group of American capitalists by means of a vast canal system through which the waters of the Yaqui are diverted and by means of tunnels and ditches conveyed to the level, fertile, sea coast valley. Many thousands of acres are now under water service and the extension of the canals and laterals will place a new section, containing over 200,000 acres, under irrigation by the spring of 1909. This work has been under way since 1884 and is now nearing completion.

In the Nazas Valley, a great plain, extending through the greater part of Chihuahua and Coahuila and bounded east and west by the Sierras of the Pacific and Gulf coasts respectively, is being irrigated. It consists of the watersheds of the Rio Grande and the Bolson of Mapimi and covers a tract measuring six hundred by four hundred miles and has an average altitude of four thousand feet above sea level.

The work in connection with this reclamation was undertaken in 1892, at which time fully 250,000 acres were under irrigation, having been served for some years by rough ditches which conveyed the water to the land. The region was then producing the bulk of the cotton crop of Mexico as well as a great production of corn and wheat.

Several million dollars are being expended in its irrigation but its wisdom is evidenced by the fact that the value of the cotton crop (of 1907) produced there exceeded ten million dollars, and marked an increase of 800% above that produced before the lands were irrigated.

In 1900 when the drainage of the Valley of Mexico was completed, a company was formed to use the waters discharged from the cut of Tequisquiac by turning them into the Rio Salado and conducting them to a reservoir formed by the Tlamaco Dam, where they are impounded. This is in the State of Hidalgo near the City of Mexico. From the Tlamaco Reservoir a canal sixteen miles long conveys the waters to the 45,000 acres which are being irrigated. The water has sufficient fall to admit of the development of 2,000 horse-power which is used in generating electricity.

The Mexican Government has under consideration a plan contemplating the impounding of flood-waters of the Nazas River by means of a dam to be built in the Fernandez Canyon.

The Government does not make a practice of undertaking irrigation projects. It is its usual custom to grant permits to private associations or to individuals, but at all times it retains control, under wise, just laws, of the waters and it fixes the prices charged as rental for water service and for the service of other quasi-public utility corporations. This practice effectually solves the trust question.

The Mexican laws provide generally that the water right belongs to the land and cannot be separated or segregated therefrom. The justice of the Mexican application of this law has proved most wise and would seem to be much better than our own. Among other things it prevents the impositions sometimes practiced in the United States, by water companies who compel the water users to pay large sums for that which is called "water-stock" and represents the farmer's right to pay to the water company a rental—sometimes most exorbitant—for the water which his lands must have.

In Sinaloa, on the west coast, a large irrigation plant is being installed. It will furnish water to a large area, 88,000 acres of which are now under water service.

In the State of Pueblo a tract containing 15 square miles or nearly 10,000 acres has been served with water at a cost of about \$100,000.00. This illustrates generally the low cost of irrigating the Mexican areas as compared with the serving of the United States sections under present day conditions. Statistical information makes clear that in the United States governmental reclamation cost is averaging nearly \$40 per acre—and the water user must absorb this cost—a thing that is not required in Mexico. It should be understood, however, that Mexican irrigation works are not nearly so substantially built as those of the U. S. Reclamation Service.

In Guerrero, \$150,000 has been expended in the completion of a large project.

Senor Creel, the recent Mexican ambassador to the United States, and the Governor of the State of Chihuahua, is placing one farm containing 6,000 acres under irrigation in that State. In Chihuahua another enterprise having in view the irrigation of half a million acres is under consideration.

In Durango a concession has been granted by which the waters of the Palmillas River will be diverted and used for irrigating purposes; and in Chiapas the waters of the Rio Canalejo will be used for the same purpose.

Just east of Monterey a vast reservoir with a capacity of 250,000,000 gallons is installed. A great pipe line, measuring six miles in length, conveys the water to the Nuevo Leon lands which are thus irrigated.

In Jalisco the State Board of Agriculture offers prizes for wells and plans contemplating the increased use of water; and releases from taxation irrigating plants and machinery used in their development.

In fact it is the general rule throughout Mexico for all of the states to offer such encouragement in emulation of the general governmental policy along that line.

In considering the question of removing to Mexico the American investigator desires information as to his civil status. Foreigners residing there have exactly the same general rights, privileges and obligations as citizens of the republic. They can not however, vote nor hold office, nor can they acquire real estate within twenty leagues of the frontier, and they are exempt from military service.

Foreigners acquiring real estate or having children born to them while in the republic, will be considered as citizens, unless at the time of registering the title to the lands, or the birth of the child, they declare their intention of not changing their allegiance.

The perfect growing conditions, salubrious climate, adequate water, lands of unrivaled fertility are all uniting to impel Mexico forward and upward to that exalted station in the scale of agricultural preeminence to which she is entitled.

The American agarian, fitted by his constant contest with less favored conditions, is doing much to gain for Mexico this destiny of hers, and for himself is gaining that towering pile of yellow coin which is our work-a-day world's best evidence of good work well done.

Irrigation in Guanajuato.

Guanajuato is one of the states of the Mexican republic where most important works have been completed for the captation of rain water and the canalization of rivers and lakes. Big dams have been erected where the soil

is irregular and the topography is favorable to them, and a good many sand docks have also been built at the section called El Bajio, and in the small valleys, where the rainfall is thus retained for a long time.

Great dams exist in the northern section of the state, such as those of the San Pedro, El Jaral, San Bartolo, La Quemada, San Juan de la Noria, El Gallinero and some other haciendas. Some of the dams are of the most modern style, the Krantz dam prevailing among them, and they represent an expense of more than three million pesos, not including the cost of government works in that section.

Nearly all the Bajio section is crossed by small sand dams which keep the soil covered with water all through the rainy season and prepare it for agricultural purposes. Marshes and wells are also used for irrigation purposes. One of the best wells now in use was drilled by the government of San Francisco, near Celaya. This well produces about five thousand liters of excellent water per minute. This and some smaller ones supply Celaya with water, a part of which is used for irrigation purposes, and for the sewerage system.

A large number of canals have been built along the Lerma and La Laja. The government is contemplating a plan for the enlarging of the capacity of the Yuriria lake, which now has about fifty million cubic meters of water, and can be increased to one hundred and twenty millions, by the deviation of the river which supplies the Cuitzeo lake. This work would place Guanajuato at the head of all the Mexican states, as to the agricultural output, as some of the best lands of the whole country would then be freely irrigated. This section is one of the best for agricultural purposes, as products of the greatest variety can be obtained, and the temperature is never so low as to cause freezing on the plantations. The property there is considerably cut up, and this circumstance would favor the intensive cultivation of the lands.

Among the most famous water works built in the state, the Esperanza dam is placed in the first rank. The construction of the dam was started by General Manuel Gonzalez, the governor of the state, and was completed by Lic. Joaquin Obregon Gonzalez, the present governor, who also built a big filter, as a part of the water works. It has a capacity large enough for the supply of the city of Guanajuato. The dam is about five miles from Guanajuato.

The water pipe system which carries the water to the city has a total length of about twenty-four miles. The big dam, which is worth seeing, was built under the direction of Ing. Ponciano Aguilar, one of the ablest engineers of the country. Its erection cost about \$200,000. Its height is about one hundred feet, and the volume of rock used in its construction amounted to nearly fifty thousand cubic meters. Its capacity is about two million cubic meters of water, which owing to the situation of the dam, reaches Guanajuato with a pressure of nearly twenty pounds.

Another dam, still bigger, is being erected at Los Castillos, near Leon, the largest city of the state of Guanajuato.

The districts where the irrigation works have been most developed are Apaseo, Valle de Santiago, Irapuato, Leon, Celaya, and Salamanca. Apaseo is a garden of unsurpassed beauty. Every square foot of the lands is irrigated by a perfect system, and the lands of the Apaseo district reach a value of about \$2,000 the hectare, which is the highest price for cultivated lands in Mexico.

While it is impossible to make an exact estimate of the agricultural production in the state of Guanajuato, some persons who are very well acquainted with the conditions there state that the annual output can be estimated from

five to six million hectoliters of corn, and one to two million cargas of wheat. This production will be greatly increased as soon as the irrigation system is extended.

Colonia Dublan Project.

In the northwestern portion of the State of Chihuahua a number of Mormons have a considerable irrigation project nearing completion. By means of a canal about five miles in length, which has been driven at great expense through the caliche (a variety of lime hard-pan) the flood waters of the Casas Grandes River are conveyed to some natural reservoirs to the eastward. These reservoirs were formerly used by the prehistoric race, who once lived in that valley, for the storage of waters to irrigate these same areas.

Early in 1909 this work will be completed, and thenceforth sufficient water can be so impounded to serve for the irrigation of about 15,000 acres of land on the beautiful plain above Nueva Casas Grandes and Colonia Dublan.

Yaqui Valley Project.

(Write Richardson Construction Co., Los Angeles, Calif.)

This project has for its zone a portion of the lands in the valley of the Yaqui River on the western coast of Sonora, Mexico, about 270 miles south of the United States boundary. In all 300,000 acres will be irrigated.

The project includes the diversion of the waters of the Yaqui River through a system of canals and tunnels at Los Hornos, where the headgates are located. The main canal will be 51 miles in length, and laterals will be built at the expense of the land holders.

The work is one of syndical enterprise and is being prosecuted by the Richardson Construction Company, a California corporation that owns the canal system and the larger portion of the land to be irrigated.

Latitude, 27 deg. 24 min. Longitude, 110 deg.

There is no public land in the zone of their operations.

Land may be purchased by individuals from the holding company for from \$35 per acre upwards.

The work is being done under a franchise or concession from the Mexican Government, which provides that if the company fulfils certain agreements and does certain things within seven years that the water right necessary to the land will be given to the Company and that the Company may sell the water represented thereby to the settlers.

Each water user is required to pay for one-acre foot each year (50c) per acre even though he may not have used that amount and for all over that which he may use he pays the same rate.

No additional charge is made for the maintenance of the main canal system, but all other canals must be maintained by the land holder.

No residence is required.

There is no limit to the acreage that one may hold.

Altitude: Average 40 feet above sea level.

Rainfall: 10 to 18 inches. Temperature, 30 degrees to 113 degrees is the lowest and highest ever recorded.

Headgates of a Yaqui Valley Project, Sonora, Mexico.



The soil varies, being of alluvial silt of the very highest rank for permanent, bounteous production close to the river and of inferior quality in other sections, some being clay and adobe.

Products: Grain, forage, hay, oranges, pineapples, dates and all semi-tropical and deciduous fruits and vegetables.

Railroads: Southern Pacific System crosses the project.

Principal towns: Esperanza, Cocorit, Los Hornos and many others.

Several years will elapse before this project is completed.

Yaqui Delta Project.

(Write Yaqui Valley Land & Irrigation Company, Bradbury Building, Los Angeles, Cal.

This project includes about 200,000 acres of best silt lands near the mouth of the Yaqui River on the Coast of Sonora, Mexico. The river at this point has, through its accumulation of silt, raised its bed and its banks above the level of the surrounding country, therefore it is feasible to divert its waters on either side. A large canal has already been constructed and is in operation on the south side of the river, and through the use of an old river channel leading to the northward, diversion is made in that direction also.

While the work originally was indulged by the private enterprise of Don Carlos Conant, his holdings were turned over to a company organized from among the land holders. Therefore the operation of the south side canal system became mutual and modeled after the water companies operating in the zones of the United States Reclamation Projects, the result being that the cost of the water service is confined to the actual expense of maintaining the already installed canal system so that the water service figures only a few cents per acre per year.

There is no public land.

Land may be purchased from the holding company for \$15.00 per acre including water stock. Buyers of the land on the south side of the River which lies within the Conant unit, containing approximately 40,000 acres, receive a double water right, for besides gaining title to all rights inherent to the land, the Mexican Government has provided in such a way that the Richardson canal system which is another south side Yaqui water project, must run its canals so that these Conant lands are served. Therefore, under this peculiar arrangement the land holder receives double water service.

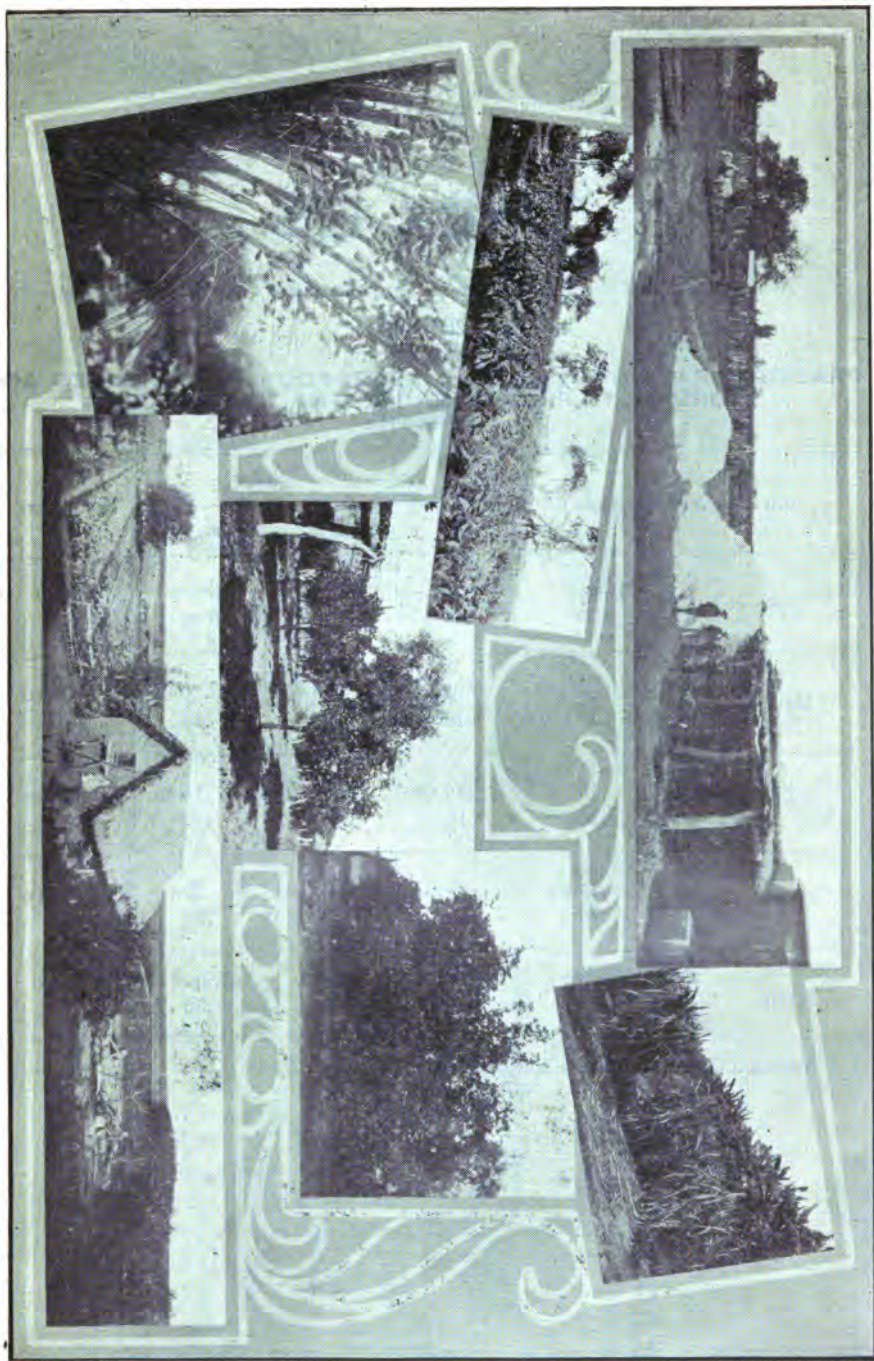
No residence is required. There is no limit to the acreage one may hold nor are there any restrictions of any nature connected with the holding of the property.

The altitude averages 40 feet above the sea level; rainfall about 10 inches; temperature 35 deg. to 105 deg.

The soil is the very highest rank of alluvial silt and is unexcelled for fertility, insuring permanent, bounteous production.

Products: Grains, forage, hay and all fruits and vegetables of semi-tropical and temperate climates.

Transportation: The Southern Pacific Railroad system crosses the lands and through ample harbors within the boundaries of the land along the coast, good water connections are had with Guaymas, a world-famed port, which lies only a few miles across the bay, and from which vessels sail to all parts of the world.



YAQUI VALLEY PRODUCTS.

1. Cotton. 2. Sugar Cane. 3. Tobacco. 4. Dates. 5. Oranges. 6. Lemons. 7. A tenant house, showing vegetables and bananas.

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TABLES

As a standard of the various grades and ratings of soils the following is presented:

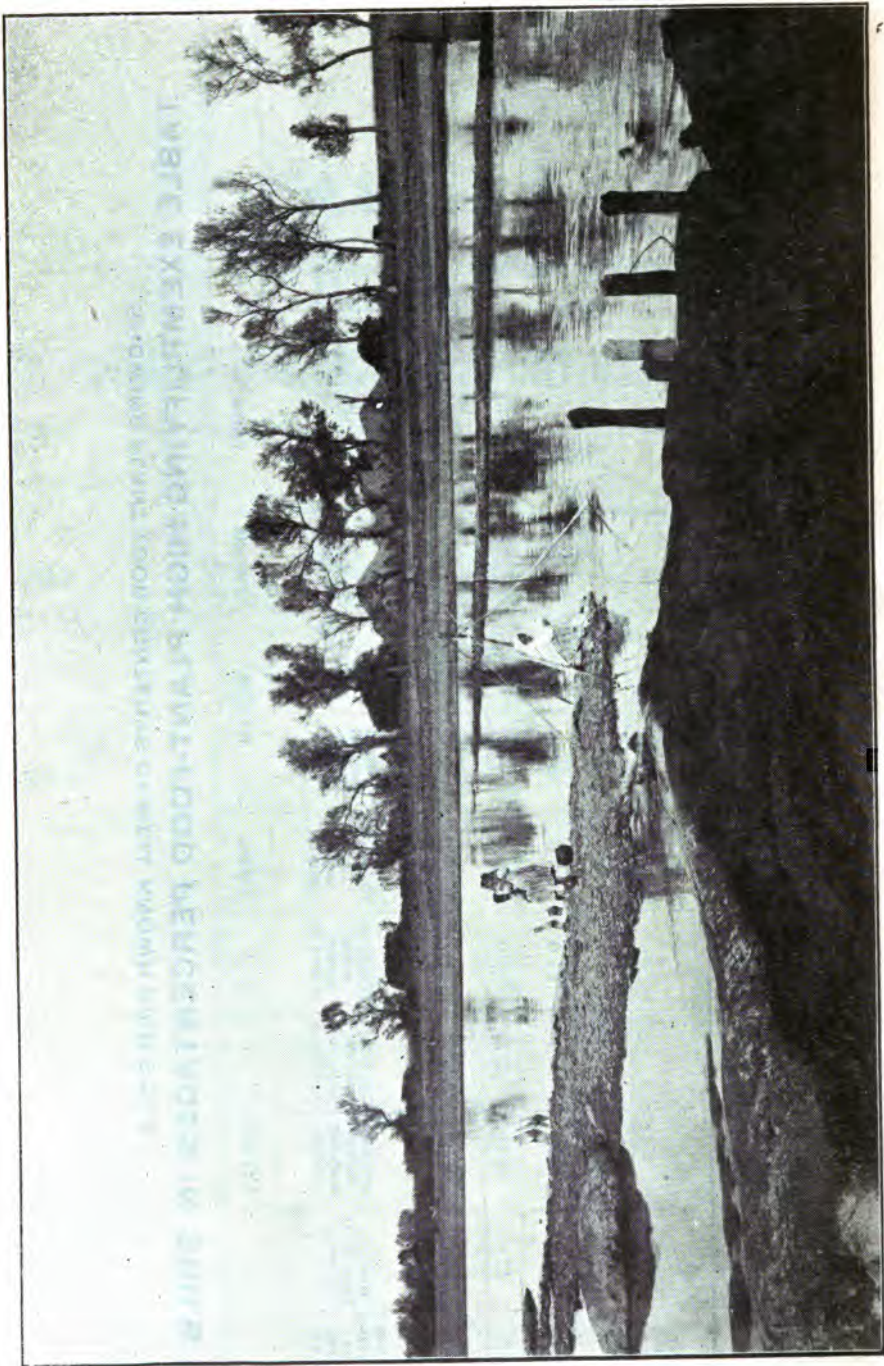
PRACTICAL RATING OF SOILS BY PLANT-FOOD PERCENTAGES ACCORDING TO PROF. MAERCKER, HALLE STATION, GERMANY

| Grade of Soil | Potash | Phosphoric Acid | Lime | | Total Nitrogen |
|---------------|-----------------|-----------------|----------------|---------------|----------------|
| | | | Clay Soil | Sandy Soil | |
| Poor | Below 0.05 | Below 0.05 | Below 0.10 | Below 0.05 | Below 0.05 |
| Medium | 0.05 to 0.15 | 0.05 to 0.10 | .10 to .25 | .10 to .15 | .05 to .10 |
| Normal | .15 to .25 | .10 to .15 | .25 to .50 | .15 to .20 | .10 to .15 |
| Good | .25 to .40 | .15 to .25 | .50 to 1.00 | .20 to .30 | .15 to .25 |
| Rich | Above .40 | Above .25 | Above 1.00 | Above .30 | Above .25 |

And as a Comparison the following table;

SHOWING PLANT-FOOD CONTENTS OF WELL KNOWN RICH SOILS
TABLE EXEMPLIFYING HIGH PLANT-FOOD PERCENTAGES IN SOILS

| | MEXICO | CALIFORNIA | | MISSISSIPPI | LOUISIANA | | TEXAS | CALIFORNIA | | | | |
|-----------------------|----------------------|-----------------------------|---------------------|--------------------------------|-------------------------------|--|--|---|--|--|--|--|
| | Tagui River lands | Orland Delta Ventura Co. | Orland Glenn Co. | Brookshot Soil, Yaso Bottom | Black Prairie Franklin Co. | Loamy Sediment Boutte, Terrebonne Parish | Rio Grande Bottom, Sandy Sediment | San Diego Co., Colorado Bottom Silt Sediment | Riverside Co., Palm Valley Marcesons Sandy Soil | Tulare Co., Experiment Station Plain Loam | Solano Co., Pallish Valley Dark Loam | San Louis Obispo Co., Arroyo Grande Valley Dark Loam |
| Potash | 0.57 | 0.49 | 0.23 | 1.10 | 0.90 | 1.03 | 1.31 | 1.18 | 1.42 | 1.20 | 0.93 | 0.67 |
| Lime | 3.85 | 0.35 | 1.53 | 1.35 | 1.04 | 1.72 | 14.43 | 8.67 | 2.20 | 1.86 | 0.77 | 2.11 |
| Phosphoric Acid... | 0.26 | 0.06 | 0.22 | 0.30 | 0.47 | 0.15 | 0.20 | 0.13 | 0.35 | 0.10 | 0.11 | 0.71 |
| Nitrogen in Humus | 0.20 | 0.32 | 0.15 | | | | | | | | | 22.00 |
| Nitrogen in Soil..... | | | | | | | | | | | | 0.67 |



Culiacan River at City of Culiacan.

Irrigated Lands of West Coast of Mexico

By J. Clyde Power, C. E.

25 years of experience as Engineer of Electric and Steam R. R's. Irrigation, Water Works, Topographic, Geologic and Hydrographic work generally. Five years in Mexico and Central America on Irrigation projects; Mexican National Railway; Texas, Topolobampo and Pacific Railway; Tehuantepec Railway; Exploration of the Isthmus of Darien for a canal line; Survey of San Juan River, Nicaragua; Survey of Fuerte River basin, Mexico, to determine irrigation possibilities and one year on the Isthmian Canal surveys.



Sugar Cane in Sinaloa

Irrigated Lands of West Coast of Mexico

By J. Clyde Power, C. E.

The beginning of irrigating possibilities direct from river flow and impounding reservoirs on the West Coast of Mexico is at the Yaqui River. The Yaqui Valley has been very fully and fairly treated at a previous place in this Manual, (See page 188). Above the Yaqui River, in the State of Sonora, save for the Colorado whose run off is vast, there is no stream whose constant size or flow gives it sufficient importance to be considered for irrigating purposes with the single exception of the Sonora River delta, lying west of Hermosillo, and whose submerged waters constitute a source of pumping waters of considerable importance to the lands lying east of the Bay of Kino toward Hermosillo. At or near the Bay of Kino these waters are tapped at a distance of only about six feet from the surface and as the land gradually rises away from the coast may be reached at depths varying up to 30 ft. The underflow is considered ample to supply pumping plants, the lands lie well for irrigating and the crop capacity of the soil is already attested by crops grown. These lands can also be irrigated with flood waters from the Sonora River. A railroad is planned from Hermosillo to the Bay of Kino passing through such large and well known Haciendas and Ranches as "La Costa Rica" and "El Carrizal." The Federal Government Agent of Agriculture at Hermosillo says of this district "With the advent of a railroad from Kino Bay to Hermosillo, the district lying between Hermosillo and the Gulf Coast will prove to be one of the richest and most productive sections in this country."

The soil at this point is rich and productive, ranging from red to a lighter soil. It is composed of an alluvial silt brought down by the Sonora River during the rainy season, and is quite deep. These lands may be classed as sub-irrigated and capable, under proper conditions of cultivation and handling, of producing excellent results to the cultivator. Cereals of all classes are produced, such as Barley, Oats, Corn and also Cotton and Sugar Cane do well here. The nearness of this district to the United States, and its proximity to railroad and water transportation facilities should make it available for American colonists in the near future. The average rainfall is stated at 15 inches. The rains fall from July to October. Fruits also should do well on these lands. Hermosillo, not far distant is the center of the orange growing industry of Sonora, a state famous for its sweet and delicious oranges. Melons, berries and vegetables also thrive here.

There is a considerable quantity of wood of the mesquite variety on these lands.

So far as known to the writer no similar opportunity for irrigation occurs above the Yaqui in Sonora.

Irrigation on the west coast of Mexico from flowing streams commences at the present day at the Yaqui River and this will be the northern limit for many years at least. Its southernmost limit as practiced or practicable today

is at about San Blas in the Territory of Tepic, with a small local possibility at Banderas Bay in the State of Jalisco, and one isolated prospect of a project to be inaugurated near Acapulco, in the State of Guerrero.

The Yaqui having been previously treated of, we will commence our observations at the Mayo River, which lies about 50 miles below the Yaqui River, in the State of Sonora.

From the lack of governmental or exact engineering data, owing to the country being in a virgin condition, and still undeveloped state, the treatment of these rivers must necessarily be more or less empirical. Nevertheless, on broad general lines the information given is authentic, based principally on personal inspection, observation and acquaintance with existing conditions, corroborated and verified by similar information and views of eminent and trustworthy Irrigating and Hydraulic Engineers who have but recently visited and inspected these rivers and valleys on behalf of important railroad and commercial interests. These interests have investigated all the existing conditions and the result has been large investments for the development of this wonderfully rich country.

MAYO RIVER.

The Mayo River lies fifty miles south of the Yaqui River and carries a reasonable quantity of water, fairly constant during the entire year.

Its mean flood waters probably carry seven thousand second feet and the subsurface flow equally as much.

The upper waters are in box canons, where impounding reservoirs can be established at reasonable cost and the waters then used for both irrigation and for the generation of electrical energy for mining operations in the mountains as well as for light at various points.

Several concessions for small amounts of water have been granted on the Mayo, by the Federal Government; such are the concession of the Compania Agricola del Rio Mayo (of Alamos), the Rosas concession and others, all of which have been taken out to supply water for individual holdings on a comparatively small scale, a few thousand acres at the most, but the river is capable of supplying many times the amount needed for the present area, and in fact, perhaps a hundred thousand acres lying in the Mayo valley and delta, which may be hereafter established. Its flow is semi-annual, like the Yaqui,

The character of the delta soil is alluvial, silt formation, very rich, an ideal Garvanzo land. The Mayo River holds the record for high yield of Garvanzos per acre, one planting on an experimental ten acres having yielded the enormous return of three hundred and sixty sacks for each sack planted. Other crops are proportionately bountiful.

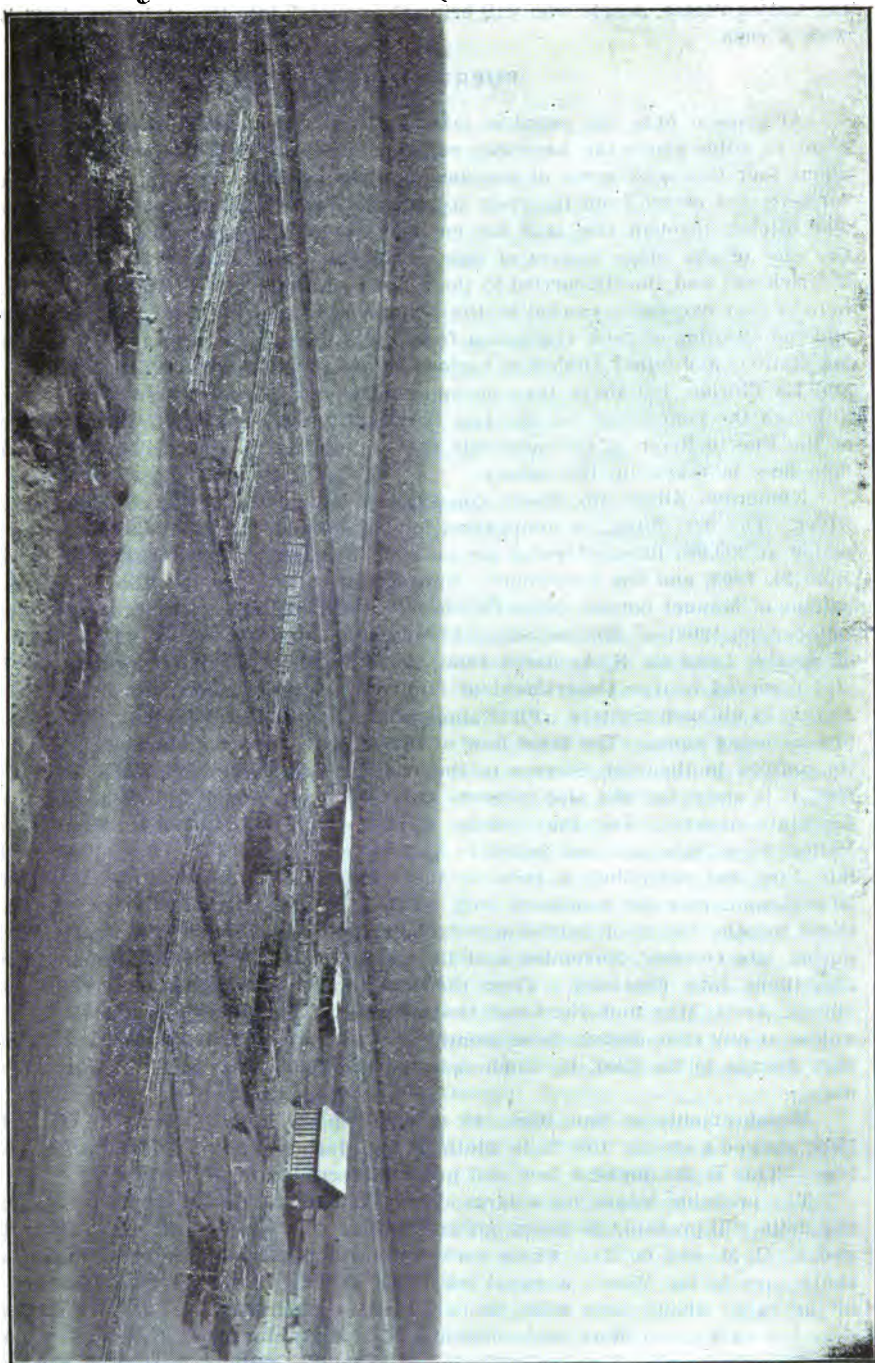
As the Mayo serves a much smaller area of delta and valley lands than the Yaqui, it is fully as available for the lands coming under any system which may be hereafter established. Its flow is semi-annual, like the Yaqui, but with heavy snows and then a thaw in the mountains of the interior, where it has its source, it will have a winter rise.

The Mayo valley equals in character of soil and lands, anything on the Yaqui or Fuerte Rivers.

The advent of the railways into this country promises a development exceeding in rapidity any agricultural district in the world.

Every day takes its train load of people into this west coast country from

San Blas Project, Mexico. Lands in the Fuerte Valley, near Colony of Bajonea.



the United States, people who will bring the country into the agricultural world, with a rush.

FUERTE RIVER.

At present only one canal is taken from the Fuerte River and that at a point 12 miles above the American colony of Los Mochis. This canal supplies about four thousand acres of the most prolific growth of sugar cane. It was formerly fed direct from the river by an inlet, but is now supplied by pumps. The ditches through this land are constructed with but slight fall, and, as in the case of any other system of light gradients, the rank growth of weeds in the rich soil and the silt carried by the water soon choke it up. The cost of water here is very excessive, caused by the high price of fuel for the pumping plants, and the cleaning of rank vegetation from the ditches. There are several pumping stations and minor ditches at various points along the river as at Constanca and La Florida, but these take no appreciable quantity of water from it, and although the concession for the Los Mochis ditch calls for 25% of the waters of the Fuerte River, it is reasonably certain that not one per cent of the surface flow is taken by the colony.

Numerous filings for water concessions have been made on the Fuerte River. The first filing, an application for 75% of the waters of the river (estimated at 200,000 litres of water per second) was made by Augustin Bila dated June 24, 1908, and has preference. Subsequent to this are the filings or applications of Manuel Borboa, dated October 13, 1908; of Ernesto Angermann, dated October 30, 1908; of Sinaloa Sugar Companies, dated November 4th, 1908, and of Sinaloa Land Co. S. A., dated June, 1909. Decision on these applications is still reserved by the Department of Fomento, Mexico, which has prime jurisdiction in all such matters. First applications have natural priority, other conditions being equal. The flood flow of the Fuerte River is enormous. Having its sources in the high Sierras to the east at an elevation of 8,000 to 10,000 feet, it is snow fed and also receives the rainfall of nearly 100 inches of that mountain district. For that reason it is frequently in flood in the Fuerte Valley when rain has not fallen in the valley for months. Beginning with late June and early July it receives the rainfall of the coastal region (about 30 inches) during the months of July, August, September and October. During these months the river carries a very large volume of water. It then lowers during late October, November and December but rises again in January and sometimes into February. Then the flow decreases during late February, March, April, May and June and the river is at lowest ebb in middle June, unless at any time during these months a thaw or heavy rainfall occurs in the high Sierras to the East, in which case the river may flow bank full for a few days.

Measurements at San Blas (40 miles from its mouth) made in Oct. 14, 1906, showed a stream 2160 ft. in width, 34 feet deep and flowing at $3\frac{1}{2}$ miles per hour. This is the highest flow and quantity recorded in 34 years.

The probable intake for a large canal system to irrigate the lower valley and delta will probably be taken out at San Blas (the junction of the S. P. R. R. and K. C. M. and O. Ry.) where rock walls are found and the river makes a sharp turn to the West. A canal taken out at this point will reach the level of the valley about three miles below San Blas and then distribute its waters over the valley and delta for a distance of 37 miles to the Gulf of California. The area to be placed under irrigation is variously estimated at from 850,000

to 1,000,000 acres. The grade is from 3 to 5 feet to the mile and the topography as level as a floor from San Blas to the sea.

It has been proposed to take another canal out at a point called San Miguel, about midway between San Blas and the mouth of the river. This will irrigate another section lower down near the south side of the river.

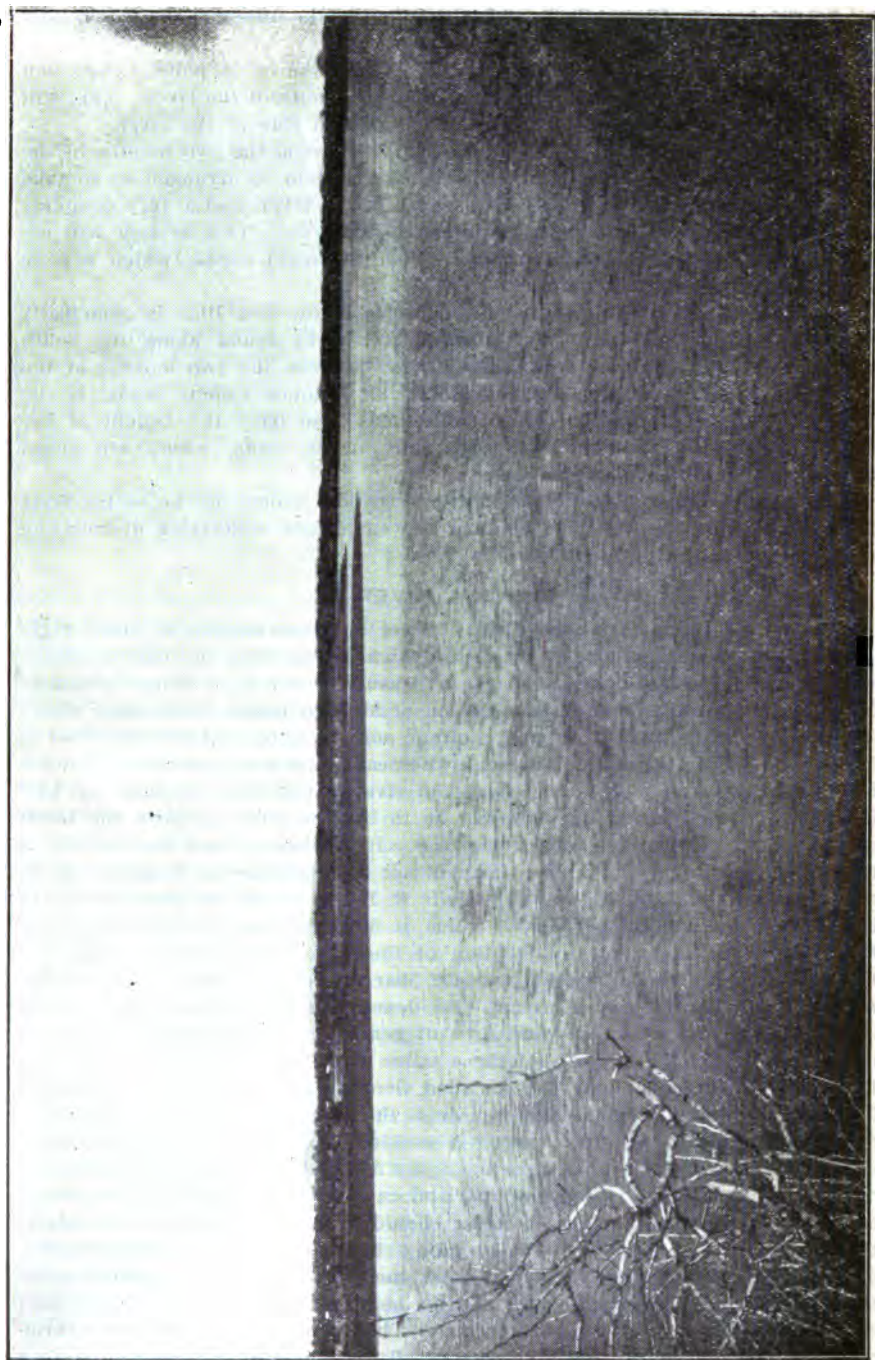
The German colony of Bajonea, which lies between the two mouths of the Fuerte River, has a small canal and irrigating system so arranged as to take water from either the North or South mouth of the river, and a very complete and costly system of distributing ditches and laterals. This system will undoubtedly be, in time, supplied directly from the main canals which will be taken out further up the river.

The soil of the main valley of the Fuerte below San Blas is principally barreal, but very fine alluvial silt lands are to be found along the south bank of the river, and the entire delta lying between the two mouths of the river, including the Zaragosa district and the Bajonea Colony lands, is the finest alluvial silt formation. The delta lands also have the benefit of the sub-surface of the river, giving perpetually moist lands, which are green with vegetation throughout the year.

The Fuerte River presents the finest irrigation project on the entire West Coast of Mexico. The cost of building the canal and underlying distributing system is estimated at \$850,000.00.

SINALOA RIVER.

From time immemorial the Sinaloa River has been tapped by small high-water ditches, used for flooding small individual ownerships, but only available at flood time. Several pumping plants also use the river as a source of supply for the same purpose such as the station of Melesio Lopez three miles above Guasave, but probably only a fraction of one per cent of the water of the river is in use. A very old concession, owned by Mexicans, now has a nominal existence but is not operated. This most beautiful river has a flow of about one-half the Fuerte River, but as its duty will be to irrigate only one-third the lands on the Fuerte, it is ample for its purposes. It debouches from the foothills a little above the town of Sinaloa, and will not be available for irrigating lands above the town of Bamoa, where the S. P. R. R. crosses it, but from Bamoa to its mouth, a distance of perhaps 25 miles, it flows through what is admittedly the most beautiful valley and section of the State of Sinaloa. Unlike the Fuerte Valley, which is principally a stiff "barreal" or clay soil, the soil of the Sinaloa Valley is silt and alluvium. Its dense and green vegetation, its tremendous crop production, its vast area of genuine river bottom, all testify to its character. At the distance of three miles above the town of Guasave it is joined on its north bank by the so-called Ocoroni Arroya, a stream but little inferior in volume during the flood season to the Sinaloa River itself. From this point to its mouth the river carries a considerable body of water, in many places several hundred yards wide and 8 to 12 ft. deep. In the lower stretches of the river it is broad, deep and still and can be readily navigated by small craft. A canal from the Sinaloa River should properly be taken out at about the City of Sinaloa, and carried down along the north bank in a northwesterly direction, to a point where it would cross the Ocoroni Arroyo, at which point the waters of the Ocoroni could readily be diverted also into it and thus corral the entire flow of the two streams. This would provide water for three hundred thousand acres, and take care of all the lands lying under the system



Fuerte River, Sinaloa, Mexico, opposite Colony of Bajonea.

in the Sinaloa Valley and perhaps a hundred thousand acres in the south part of the Fuerte Valley.

The flow of the Sinaloa River is possibly 75,000 litres of water per second. Nowhere in the U. S. or Mexico are the possibilities for great crops equal to those of the beautiful Sinaloa Valley. Irrigation for this valley is not so great an undertaking as some others, not so costly, but the results, to be obtained will surpass the famous valley of the Nile.

MOCORITO RIVER.

This river has its sources altogether within the State of Sinaloa and is usually but little more than a large creek, drying up almost entirely during the dry season. It has one large pumping station on it just below the town of Mocorito to supply water for the Hacienda of Tres Hermanos, and the supply is insufficient during the dry season to supply water for more than a few hundred acres of sugar cane. It has no value as an irrigating stream unless steps are taken to impound its waters in the canyons in the foothills, which would be an expensive proposition. During the rainy season, from June to October and even later, the Mocorito carries quite a volume of water, possibly 20,000 litres of water per second, but soon dries up and almost disappears after the rains cease. It has no appreciable value as an irrigation proposition under present conditions or under conditions that will be likely to present themselves during the next twenty years. It may be considered an inappreciable factor in irrigation in Sinaloa at the present time.

CULIACAN RIVER.

This river is formed by the junction of the Tamazula and Humaya rivers at the site of the City of Culiacan. Its sources extend beyond the boundaries of the State, but only because the State of Sinaloa is much narrower at this point than further north. Were the state as wide at this point as in the District of Sinaloa or Fuerte, its sources would be altogether within the state boundaries. Its wide bed gives testimony to the violence of its flood waters, which hurl themselves to the sea in great quantities at stated intervals and then quickly subside to a low level. Numerous pumping stations have been erected along its banks from Culiacan to Limoncito, where the railroad to Altata harbor crosses it. Several of these pumping plants have been washed out from time to time as the channel changes frequently in high floods. The waters of the Culiacan are under concession to the Almada Hermanos, owners of the sugar cane Hacienda of Navolato. A subsequent arrangement has been made with them by the Sinaloa Land Co. S. A. whereby the Sinaloa Land Co. undertakes to construct a canal from a point near the City of Culiacan to its lands just above Navolato, under which the Almadás retain prior right to their own supply of water for their Hacienda. Definite data are difficult to obtain as to the flow of the river at Culiacan but the accompanying photograph illustrates the river at that point. The lands in the Culiacan Valley between Culiacan and Navolato are a stiff barreal (clay) soil, requiring large amounts of water. Distance to potable water from the surface is about forty feet. The section near the river (known locally as the lands below the first bench) is subject to overflow and consequent loss of crops. The labor situation is a difficult one owing to proximity to a large city and prevalence of malaria.

SAN LORENZO RIVER. •

This stream carries a good flow of water, and a concession is out for part of the waters. The irrigable lands are of excellent quality, especially for sugar cane. One large hacienda owned by Redo Hermanos now utilizes some of these waters. Another on the south bank has a small canal built to the east edge of its property and proposes to complete it. The irrigable area is comparatively small, but of good quality and character. As an irrigation proposition it is not of great importance in the state at large, but nevertheless not a negligible quantity.

ELOTA, PIAXTLA AND QUELITE RIVERS.

No appreciable development on these rivers and but little probability of any. The area between the foothills and the sea is very small, of irrigable lands, and while the quality is fair, development will only be required for comparatively small individual uses on hacienda. There is not now and never will be demand for systems from any of these rivers, or not at least until a great rise in value and demand for lands compels the use of small areas.

MAZATLAN RIVER.

This river finds its sources in the State of Durango, and carries a considerable volume of water throughout the year. But its principal use is a source of water supply for the city of Mazatlan and for watering small gardens and farms. The foothills lie close to the sea here and it has but a small area to serve of irrigable lands. Considerable power can be ultimately developed from it in the foothills and mountains, which, from its proximity to the city of Mazatlan, will prove valuable in time. It empties into the Pacific Ocean about twenty miles below the city of Mazatlan. An immense amount of electric energy could be developed and distributed at a large profit.

BALUARTE RIVER.

This answers about the same description as the Mazatlan, except that the area of level lands it may serve is more extensive in area, owing to the widening out of the coastal plain below Mazatlan. Its sources are not so far back from the coast as the Mazatlan, but it flows more evenly over a wider stretch of coastal plain and is somewhat broader and deeper and receives slightly more rainfall than the Mazatlan River, as the rainfall increases rapidly after leaving Mazatlan toward the south.

RIO DE LAS CANAS.

This river forms the lower part of the boundary line between the State of Sinaloa and the Territory of Tepic, and deserves special mention.

It finds its sources in the mountains of Durango, partly also in Tepic and in Sinaloa. The rainfall here is about 45 inches on the coast and the coastal plain here widens out considerably and the stretch of plain from the foothills to the sea is considerable. The river flows placidly between its banks and is of considerable depth almost to the foothills, thus affording good transportation facilities and reasonably good navigation for a considerable distance to the interior. The river carries a large amount of water throughout the year and will unquestionably give all the water that will ever be required to fully and amply irrigate all lands which can possibly be brought under its waters.

The climate here is rather moist and humid, the evaporation slight, and it is the home of fine grasses and luxuriant plants and foliage. The lands lying along the banks of this river grow bananas in fullest perfection and it is altogether probable that this section will be noted in the future for its production of tropical rather than semi-tropical fruits and products.

ACAPONETA RIVER.

The description of the Rio de las Canas applies equally to the Acaponeta River. It waters about the same kind of lands, runs through much the same stretch of country and will undoubtedly some time in the future be available as the source of irrigation for large tracts of fertile coastal plain lands for tropical products. The mouth of the Acaponeta is about twenty miles south of the Rio de las Canas.

RIO GRANDE DE SANTIAGO.

This magnificent "River of Saint James" rises in the State of Jalisco near Guadalajara and is the outlet of a large lake. On its way down the mountain side descending to the sea it drops over 5000 feet and is now furnishing many thousands of horse-power to the city of Guadalajara. It has potentialities of even hundreds of thousands of horse-power more which will, in course of time, be developed and utilized. It is an immense stream, a veritable Ohio River in size, volume and current, and is a lordly river as it winds its way to the Pacific Ocean over the final stretch from the foothills to the sea. In its last meander it carries an immense body of water and can be utilized for irrigation on an immense scale. Its utilization for such purposes is still far in the future but will undoubtedly come in due course of time and events as the country it dominates is a fine one and susceptible of great development.

RIVERS FURTHER SOUTH.

The next stream of any importance further south empties into Banderas Bay and will be of only small local importance to irrigate some banana groves lying in and about Las Penas, a small village lying at the head of Banderas Bay. Between this point and the Isthmus of Tehuantepec there are five good rivers, but the territory they drain is practically "tierra incognita," inhabited sparsely by Indians, with little or no development, entirely away from civilization and whose development lies so far in the future as to make their consideration an impracticable matter at this time. Perhaps one exception may be noted at Acapulco, where the plans of a Seattle syndicate, the Mexican-Pacific Co., call for the utilization of the waters of the river near Acapulco for irrigating about 40,000 acres of lands near the coast. Large capital lies behind the project, and men of talent and enterprise, and their plans are far-reaching and comprehensive, including the building of a short line of railroad, building an irrigation plant, placing of a line of steamers between Acapulco and United States ports and a general development and colonization scheme. But aside from this at the present writing there is absolutely no irrigation enterprise of any note or worth mentioning clear to Panama. From the Guatemalan border on south to Panama the rainfall is ample for all crops and irrigation will never be extensively practiced.

In considering these various projects and prospects it has been the writer's aim to present in a lucid way the general characteristics of that part of the west coast of Mexico which is today attracting the attention of agriculturists and capitalists from all parts of the world.

Its close proximity to the United States, its ideal climate for agriculture and the reasonable cost of its lands make it the most enticing part of the world today for development.

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